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INTEGRATED CIRCUIT ELECTROMAGNETIC SUSCEPTIBILITY INVESTIGATION - PHASE II

TEST AND MEASUREMENT SYSTEMS

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY - EAST

MCDONNELL DOUGLAS CORPORATION

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MCDONNELL DOUGLAS CORPORATION

PREFACE

This document is one of eight task-oriented reports prepared under Contract No. N00178-73-C-0362 for the U. S. Naval Weapons Laboratory, Dahlgren, Virginia 22448. The McDonnell Douglas Astronautics Company Personnel involved were:

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1. INTRODUCTION AND SUMMARY

This report describes the RF test fixture and the semi-automatic test set up developed on contract number N00178-73-C-0362 to investigate the susceptibility of integrated circuits to high power RF signals. Some of the material contained herein has appeared in previous reports, but is also included here to provide a complete testing document.

Test fixtures were fabricated to permit testing of integrated circuits with up to 16 leads on three different package styles (flat-pack, dual in-line, and TO-5 can) while fully biased and operational. The semi-automatic test system was developed to facilitate collecting the enormous amount of data needed for the integrated circuit susceptibility investigation. The heart of the system is an HP9810A programmable calculator and a 50-channel scanning digital voltmeter; however, several circuits had to be designed and fabricated to aid in biasing and loading the IC and to interface with the computer.

To facilitate reading, figures start on page 16 and tables start on page 74.

2. TEST FIXTURES

Development of suitable test fixtures and a semi-automatic test system to assist in collection and recording of data was a key achievement of this program. This section describes the test fixtures and the principles used in their design. Design of the test fixtures incorporated the following requirements:

(1) interface the IC with conventional RF transmission lines

(2) provide operational conditioning for biased testing of ICs

(3) permit determination of dissipated RF power within the IC to an absolute accuracy of 10%

(4) exhibit a bandwidth of 100 MHz to 12.4 GHz

(5) permit repeatable measurements.

A test fixture for each of the three package styles (flat-pack, dual in-line, and TO-5 can) is now available. In an earlier report we had indicated an approach involving a universal base module containing the RF input lines and having bias units incorporated into each line to separate the video and RF frequencies. After further consideration, we decided that the advantages associated with having more than one complete test fixture available outweighs the small cost savings associated with the universal base module concept. Consequently, a complete test fixture is available for each package style.

Each fixture features stripline technology to interface between the IC package and conventional RF transmission line. Stripline launchers accomplish the transition from coaxial transmission line to the stripline paths on the board. Type N connectors provide standard, reliable, well shielded RF connections. Such connection ease expedites measurements at all ports. The video inputs to the test fixture are through type BNC connectors. Paragraphs 2.1, 2.2, and 2.3 describe the test fixtures for the flat-pack, dual in-line, and TO-5 can packages, respectively. The bias units are the same for all the test fixtures and are described in paragraph 2.4

2.1 Flat Pack Test Fixture - Figure 1 is an exploded view of the test fixture which will accommodate flat pack ICs having up to 16 leads. Items (19) and (20) form the stripline feed system (consisting of two copper clad, low loss tangent, dielectric boards). The bottom board has the stripline paths etched upon it. Installation holes in the centers of the top dielectric board and cover plate permit the IC to be placed within the fixture. An IC lead locater plug, item (15), taken from an integrated circuit test socket is press fitted into the center of the bottom dielectric board. It holds the device in a consistent orientation which assures proper alignment of the leads.

A cover plug, item (12), fits snugly into the installation hole enclosing the IC within the stripline feed system. The cover plug also provides dielectric continuity above the device and RF shielding integrity for the top aluminum cover plate. By applying pressure upon the IC leads which lay atop the stripline feed system in the fixture, the cover plug connects the IC to the stripline. Rubber pads, item (13), evenly distribute the pressure to all IC leads. A toggle clamp, item (4), provides an adjustable pressure to enable a reliable connection.

Structural rigidity is required of the fixture to permit repeatable data. Consequently, the stripline boards are enclosed in an aluminum housing which keeps the dielectric boards from flexing or moving. Screws shorting the two ground planes together are located at intervals of less than one-half wavelength at the highest frequency of interest to prevent propagation of higher order modes.

The bias units, item (27), are connected to the stripline type N launchers and are held in place by the test fixture skirt, item (22). The lower connector on each bias unit is the RF input (or output) and is DC isolated from the IC. DC bias and video pulses can be applied or measured using the upper connector on each bias unit.

2.2 Dual In-Line Package Test Fixture - Figure 2 is an exploded view of the test fixture which will accommodate dual in-line packaged ICs having up to 16 pins.

Items (10) and (11) form the stripline feed system. The top board has the stripline paths etched upon it. A 16 pin dual in-line socket, item (8), is used to assure a consistent orientation of the IC under test. The copper on the ground plane side of the top board has been removed from under the socket and holes drilled through the dielectric board for the 16 pins from the socket. Each pin is soldered to the appropriate stripline center conductor. The socket is held securely in place by small tabs, item (6), bolted to the top plate of the aluminum housing. The cover plug, item (1), and spring loaded hold down, item (2), assures RF shielding integrity for the top plate. Removal of the IC is facilitated by a lever, item (18), and two small teflon rods, item (19).

Structural rigidity is obtained in the same manner as for the flat pack package test fixture. Bias units are connected and used in the same way as for the flat pack package test fixture.

2.3 TO-5 Package Test Fixture - The TO-5 package test fixture was designed to accommodate TO-5 cans having 8 or 10 pins. Figure 3 is an exploded view of the test fixture. Items (9) and (10) from the stripline feed system. The top board has the stripline paths etched upon it. Two interchangeable top boards are required; one for 8-pin TO-5 packages, another for 10-pin packages. A socket, item (7), is used to assure a consistent orientation of the IC under test. A test cap, item (6), provides alignment guides for the pins to facilitate placement of the IC into the socket. The copper on the ground plane side of the top board has been removed from under the socket and holes drilled through the dielectric board for the socket pins. Each pin is soldered to the appropriate stripline center conductor. The test cap and socket are held securely in place by the aluminum housing, with the top plate contacting the lip around the bottom of the test cap. The cover plug, item (1), and spring loaded hold down, item (2), assures RF shielding integrity for the top plate. Removal of the IC is facilitated by a lever, item (21), and a small teflon rod, item (13).

Structural rigidity is obtained in the same manner as for the flat pack package test fixture. Bias units are also connected and used in the same way.

2.4 Bias Unit - The function of the bias insertion unit is to provide a low-pass path for the video signals while providing high-pass characteristics for the RF signal. The problem is complicated by the wide RF frequency band (100 MHz to 10 GHz) over which the unit must perform. Desirable video section performance is free passage of video signals up to approximately 10 MHz while rejecting RF signals by approximately 20 dB. The RF section must provide RF transmission properties with no large reflections due to mismatches in the line, especially near the video section connection. The basic design requires a capacitor (DC block) in the RF line to reject low frequency signals and an inductor (RF choke) in the video line to reject high frequency signals. Achieving a good RF choke in the microwave region is difficult across a wide band due to resonances in interwinding capacitances or distributed parameters. The use of ferrite material as a core offered the best chance for success.

After considerable development, success was achieved with the design diagrammed in figure 4. A 2 1/2 turn choke on a ferrite core provided the RF choke while a commercial DC block (coaxial) is used in the RF line to isolate low frequency signals. Figure 5 is a cutaway drawing of the assembled bias unit.

This bias unit provides a nominal 20 dB isolation from the RF path to the bias input port, passes a one microsecond, one ampere pulse with an 80 nanosecond rise-time from the bias port to the test IC, and has an RF path insertion loss of 3.5 dB or less. Figure 6 shows the measured insertion loss from the RF path to the bias input port. Figure 7 shows the measured RF insertion loss through the RF path.

Figure 8 shows the setup used to measure the video path response to short, high current pulses. Figure 9 compares the open circuit voltage available from the pulse generator to the received pulse at the test device port. At current levels up to

one ampere, no ferrite saturation effects are seen, and the risetime is shown to be approximately 80 nanoseconds. Protection offered to the RF generator by the DC block is shown in figure 10. Table 1 lists the data for loss calibration for the 16 bias units used for the interference testing.

3. SEMI-AUTOMATED TEST SYSTEM

To facilitate collecting the enormous amount of data needed for the integrated circuit susceptibility investigation, MDAC-E developed a semi-automatic test system specifically for use on this contract. The heart of the system is an HP9810A programmable calculator and a 50-channel scanning digital voltmeter. Data is recorded on a digital tape cassette for later processing in an HP9830A computer. The following paragraphs describe the test set ups, test procedures, computer programs, and peripheral equipment designed and fabricated to aid in testing the various types of integrated circuits.

3.1 Crystal Detector Calibration - One of the critical tasks in setting up the semi-automatic test system was the calibration of the crystal detectors to permit determination of RF power level at each port of the test fixture during a test. A test requires monitoring the power entering one port and exiting from as many as 16 ports (the other 15 pins on the IC plus the reflected power from the input port). Seventeen HP423A crystal detectors were calibrated by subjecting them to sequential steps of RF power while monitoring the detected voltages. Each crystal detector was terminated in a 10K ohm resistor. This value was chosen as a compromise for obtaining adequate detected output voltage while not appreciably affecting rise and fall times during testing for pulsed conditions.

Calibrations were performed at all five test frequencies (.22, .91, 3.0, 5.6 and 9.1 GHz). The data was processed to obtain a least squares fit to the equation:

$$y = B_0 + B_1 x + B_2 x^2 + B_3 x^3$$

where: $y = \log_{10}$ (RF power)

$x = \log_{10}$ (detected voltage)

and B_0, B_1, B_2, and B_3 are the calculated coefficients. The cubic-order power-series-fit proved to be quite adequate over the power range of .01 to 100 milliwatts required

for testing after accounting for the various coupling and attenuation factors associated with each port. Table 2 shows a typical data tabulation where the actual and calculated values are compared. Figure 11 shows a graph of a typical calculated function and the measured data points. Tables 3 through 7 show the values of the coefficients which are used by the HP9810A calculator to compute the various power levels as the detected voltages are measured.

Figure 12 shows the data acquisition and recording set up for the crystal detector calibration. Figures 13 through 17 are block diagrams of the RF portions of the crystal calibration test set ups for each of the five test frequencies. The HP9810A program used to acquire and record the crystal detector calibration data is shown in table 8. The recorded data at this stage is not in array format. To change the data to an array format, which is desirable for data reduction by the HP9830A, and to obtain a hard copy of the data, the recorded data was then processed on the HP9830A computer calculator, using the program shown in table 9, and recorded. The program shown in table 10 was then used in calculating the calibration coefficients on the HP 9830A.

3.2 RF Test Fixture Calibration - Each test fixture was characterized for dissipation loss without bias units. Dissipation loss is a measure of the fraction of RF power lost from a given path within the fixture. That fraction of power not dissipated in the fixture or coupled out of the ports must be delivered to the IC. Fixture dissipation had to be determined accurately, since a knowledge of power dissipation within the device to an absolute accuracy of $\pm$10% was desired.

Dissipation losses are primarily due to characteristics of the stripline paths within the fixture. The dissipative loss per stripe, L, is defined as the ratio:

$$L = \frac{P_{in}}{P_{out}} > 1$$

where P_{out} is the power delivered at the end of the stripe for an input power P_{in}.

Since each stripe is the same length and shape, L is assumed to be the same value for each of the i stripes. This assumption was verified experimentally.

Referring to figure 18, the power which comes out of each port must be L times greater at the center of the fixture. Hence, P_{dist}, the total power distributed from the center, is given by:

$$P_{dist} = \sum_{j=1}^{i} LP_j$$

P_a is the amount of power available for distribution from the center of the fixture and is given by:

$$P_a = \frac{P_{incident}}{L}$$

Conservation of energy requires that these two quantities be equal. Hence:

$$P_a = P_{dist}$$

and,

$$L^2 = \frac{P_{incident}}{\Sigma P_j} \qquad (j = 1 \rightarrow i)$$

It is not possible to measure directly the loss per stripe because of lack of connectors at the IC end of each stripe. A dummy IC was made for each test fixture which shorted stripes together so that a continuous path was provided between ports.

By using each port for power input to the fixture at each given frequency, i different values of L were measured for each fixture. Statistical analyses were performed on this group of loss factors to compute the average loss and the standard error. The test fixture calibration was performed using the semi-automatic test system. In operating the system for test fixture calibration, the operator initiates the data cycle by pressing the CONTINUE button on the HP9810A calculator. The system sequentially samples the RF power level of the required number of ports by means of the calibrated crystal detectors and records the data. The operator then changes the input ports, presses the CONTINUE button again, and more data is acquired and recorded. This process is repeated until all ports have been used as

input ports. The HP9810A then calculates and prints out (on a typewriter) the calculated loss when using each port as an input, the mean loss and the standard error (all in dB).

Figure 19 shows the data acquisition and recording set up for test fixture calibration. Figures 20 through 24 are block diagrams of the RF portions of the test set ups. Table 11 is a listing of the HP9810A program for the test fixture calibration and table 12 lists the data register allocations for that program. Tables 13 through 17 show the data resulting from the measurements and calculations for the 16 pin dual in-line package test fixture. Tables 18 through 22 are the results for the 8 pin TO-5 package test fixture.

3.3 Interference Testing Using the Semi-Automatic Test System - The semi-automatic test system is illustrated in figure 25. Acquisition and storage of the data in the laboratory is controlled by an HP9810A claculator. It also directs the data recording on digital tape cassettes. Analysis of this data is performed using an HP9830A computer. A hard copy of the data, an example of which is shown in table 23 is prepared to verify successful data runs and as insurance against mishap with the tape. The computer is also used to prepare curves such as shown in figure 26, thus providing a pictorial representation of the data to aid in analysis.

In operating the semi-automatic test set-up for interference testing, the operator selects an input power level to be applied to the device and initiates the data cycle by pressing the CONTINUE button on the HP9810A calculator. The system sequentially samples the RF power level of the required number of ports by means of the calibrated crystal detectors, computes the ratio of power delivered to the device to the input power (the calibration factor) using a stored program and constants, then measures various device voltages and currents. Selected device voltages and currents and the calibration factor are stored along with the corrected power dissipated in the chip (which is the independent variable) on the digital tape cassette. A photograph of the system in operation is shown in figure 27.

The test set ups and computer programs used are very similar for all the device types tested. There are some differences due to the number of ports to be monitored, bias and loading requirements, test equipment availability, and improvements in programming techniques over the term of the contract.

3.3.1 7400 NAND Gate Interference Testing - The 7400 NAND gate contains four 2-input NAND gates in a 14 pin flat pack. Nondestructive measurements were made with the device in active bias states using the RF test fixture described previously. Figure 28 shows the data acquisition and recording set up for interference testing of the 7400. Figures 29 through 33 are block diagrams of the RF portions of the 7400 interference test set ups for each of the five test frequencies. Figure 34 shows the interference test flow diagram for the 7400 device and table 24 is the program for the HP9810A used to incorporate this procedure. To keep track of the data, each device was given a pre-test sample number which encoded all the pertinent data about its test configuration (frequency, port, bias state, and device number from 0 to 9). This sample number is entered into the measurement system manually and becomes a part of each file of data on the magnetic tape.

Table 25 is a listing of the program for the HP9830A to change the data acquired by the HP9810A to an array format, which can be used more efficiently by the HP9830A during later data reduction. Table 26 is a listing of the program for the HP9830A to plot the 7400 data after conversion to the array format.

3.3.2 741 Operational Amplifier Interference Testing - Interference testing on the 741 operational amplifier was conducted in a manner similar to that for the 7400. Figure 35 shows the data acquisition and recording test set up for the testing. Figures 36 through 40 are block diagrams of the RF portions of the test set ups. Table 27 is the program for the HP9810A used to acquire and record the data and table 28 is a list of the data register locations required for the program. The test frequency, port, and device number were encoded and entered into the measurement

system manually. Table 29 is a listing of the program for the HP9830A to change the data acquired by the HP9810A to an array format. Table 30 is a listing of the program for the HP9830A to plot the 741 data.

3.3.3 MOS 4011 Interference Testing - The MOS 4011 contains four 2-input NAND gates utilizing CMOS fabrication techniques in a 14 pin flat pack. Figure 41 shows the data acquisition and recording test set up for interference testing of this device. Figures 42 through 45 are block diagrams of the RF portions of the test set ups. Figure 46 shows the interference test flow diagram and table 31 is the program for the HP9810A used to incorporate this procedure. Table 32 is a list of the data register locations required by the program. The test frequency, port, and device number were encoded and entered into the measurement system manually. Table 33 is a listing of the program for the HP9830A to change the data acquired by the HP9810A to an array format and table 34 is a listing of the program for the HP9830A to plot the MOS 4011 data.

3.3.4 2002 Hybrid Interference Testing - Figure 47 shows the data acquisition and recording test set up for interference testing of the 2002 hybrid. Figures 48 through 51 are block diagrams of the RF portions of the test set ups. Table 35 is a listing of the program for the HP9810A used for the interference testing and table 36 lists the data register locations required by the programs. Again the test frequency, port, and device numbers were encoded and entered. Table 37 is a listing of the program for the HP9830A to print the 2002 data.

3.3.5 Extra Digital Devices Interference Testing - The following digital devices received more limited interference testing than the devices discussed above: 3021, 7432, 7402, 7404, 7405, 7450, 7473, and 7479. This testing was performed to verify the MDAC-E 7400 susceptibility model for other devices. These devices were tested using only four input power levels (vs 20 for the others): (1) no input power, (2) power which would cause a previously set interference threshold to be crossed,

(3) maximum power the crystal detectors could safely stand, and (4) a point approximately half-way between the interference threshold and the crystal detector maximum. As shown in figure 52 the interference threshold level was determined using a comparator box, which compared the output from the device under test to a previously determined level. RF power with a pulse width of 500 microsecond was applied to the device when setting up the interference threshold level, to reduce heating effect contributions, but the data was obtained with CW input at that level. Block diagrams of the RF test set ups are the same as for the 2002 (Figures 48 through 51). Table 38 is a listing of the HP9810A program. The data register locations are the same as for the 2002 (table 36). Table 39 is a listing of the program for the HP9830A to reduce the data from the HP9810A.

3.4 Special Circuits - Design and fabrication of several special circuits were required to bias, load, and test the various types of ICs whose susceptibility was evaluated. These circuits were shown in block diagrams in preceeding paragraphs where applicable. The following paragraphs give a short description of the function of each circuit along with a schematic.

3.4.1 Digital Control Box - The digital control box supplies worst case loading to the digital device under test while providing voltage and current monitoring of all device terminals. A schematic of the digital control box is shown in figure 53.

3.4.2 Operational Amplifier Control Box - The operational amplifier control box supplies loading to the operational amplifiers contained in the linear test devices and provides voltage and current monitoring of all device terminals. A schematic of this control box is shown in figure 54.

3.4.3 MOS Control Box - This circuit provides biasing and loading for the MOS digital devices and also provides for voltage and current monitoring of the devices. The schematic is shown in figure 55.

3.4.4 Comparator Box - The Comparator Box is used to monitor the output(s) of the devices during the Extra Digital Devices Interference Testing and to indicate when an interference threshold is exceeded. A schematic of the comparator is shown in figure 56.

3.4.5 Comparator Control Box - The comparator control box supplies loading to the comparator linear test device and provides voltage and current monitoring of all device terminals. A schematic of this control box is shown in figure 57.

3.4.6 Voltage Regulator Control Box - The voltage regulator control box supplies loading to the positive and negative voltage regulators contained in the linear test devices and provides voltage and current monitoring of all device terminals. A schematic of this control box is shown in figure 58.

4. CATASTROPHIC FAILURE TESTS

Tests were performed to determine the power levels at which catastrophic failure occur for the 7400 and the 741 operational amplifier. 800 7400's were tested: 20 in each of two states, at each of four input ports, at each of five frequencies. 560 741's were tested: 20 with input power at each of seven ports, at each of four frequencies (9.1 GHz was not included). Figures 59 through 63 shows block diagrams of the test setups for the catastrophic failure testing.

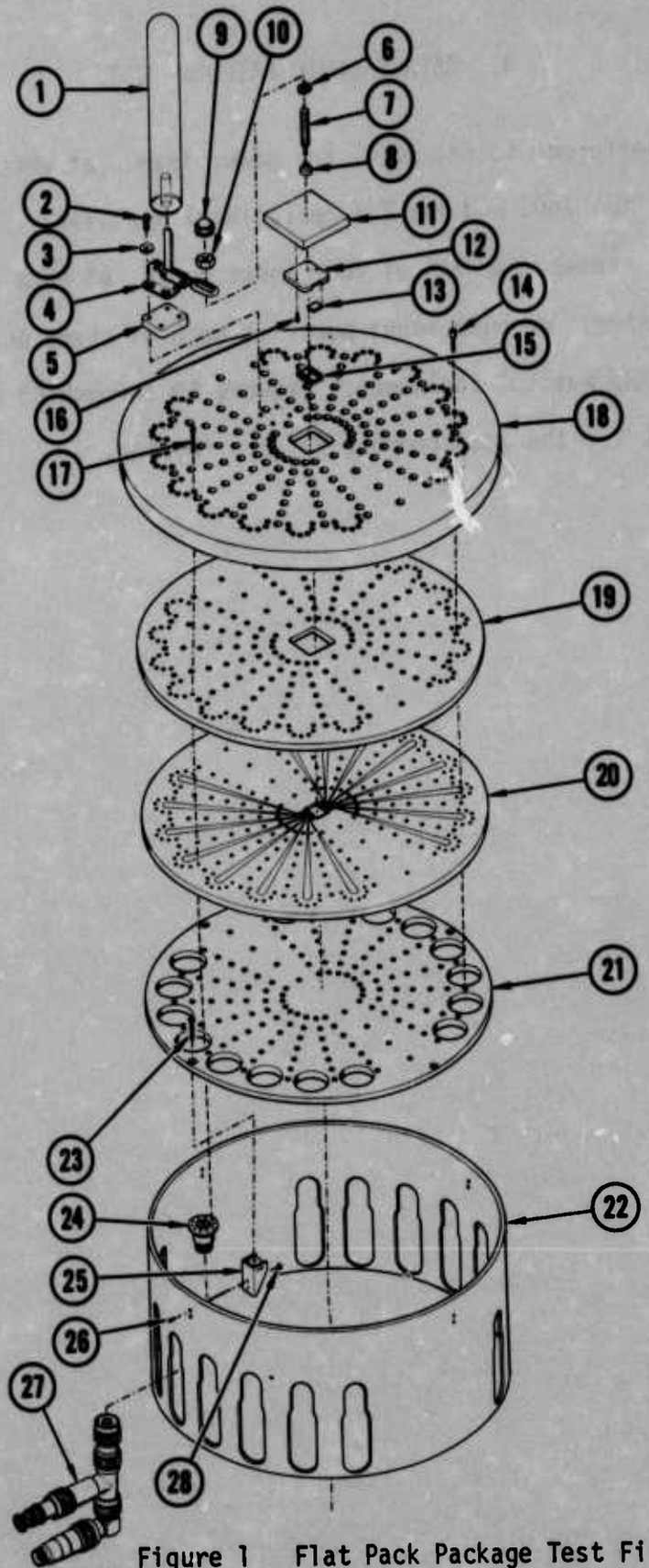


Figure 1 Flat Pack Package Test Fixture - Exploded View

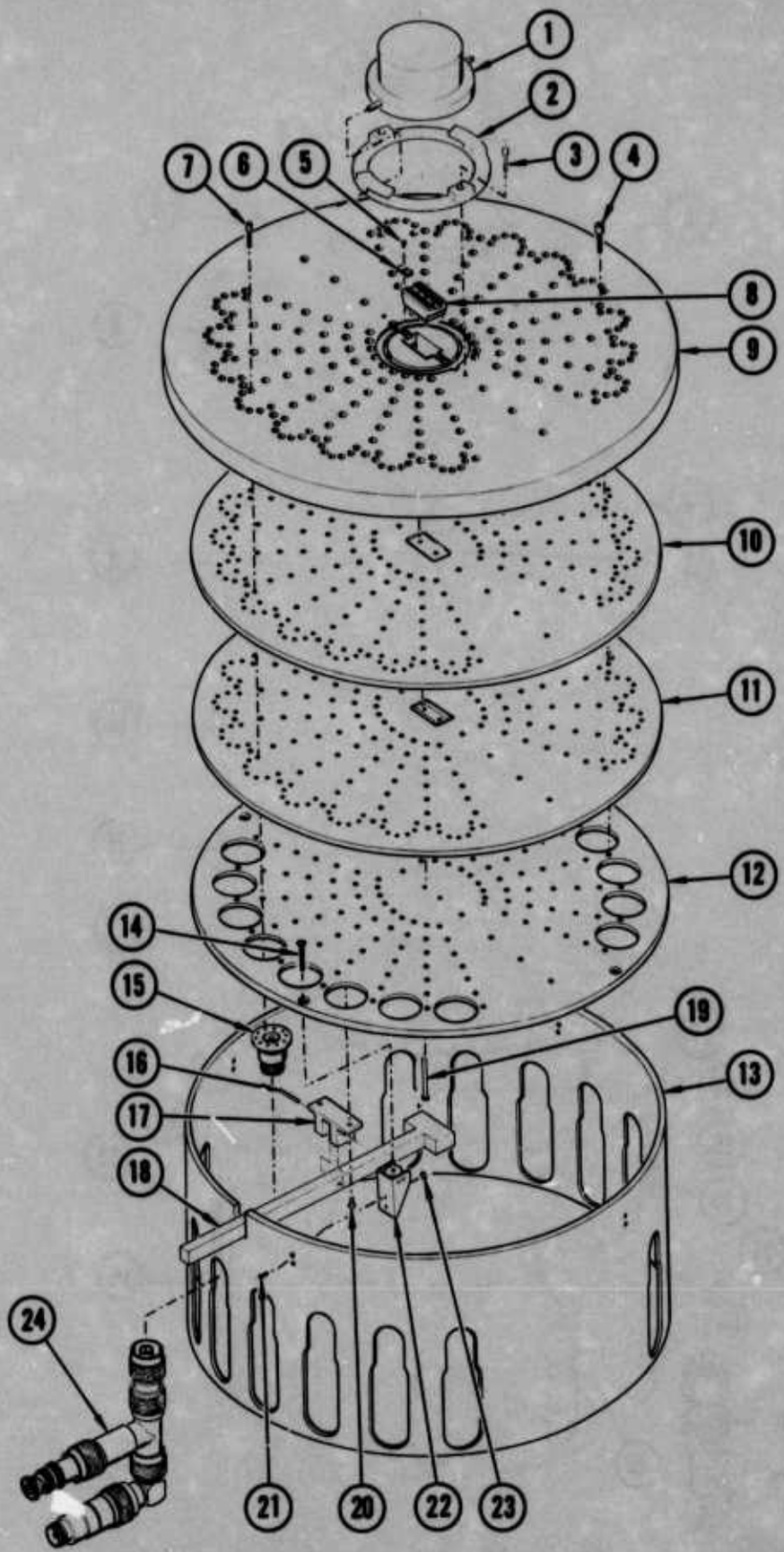


Figure 2 Dual In-Line Package Test Fixture - Exploded View

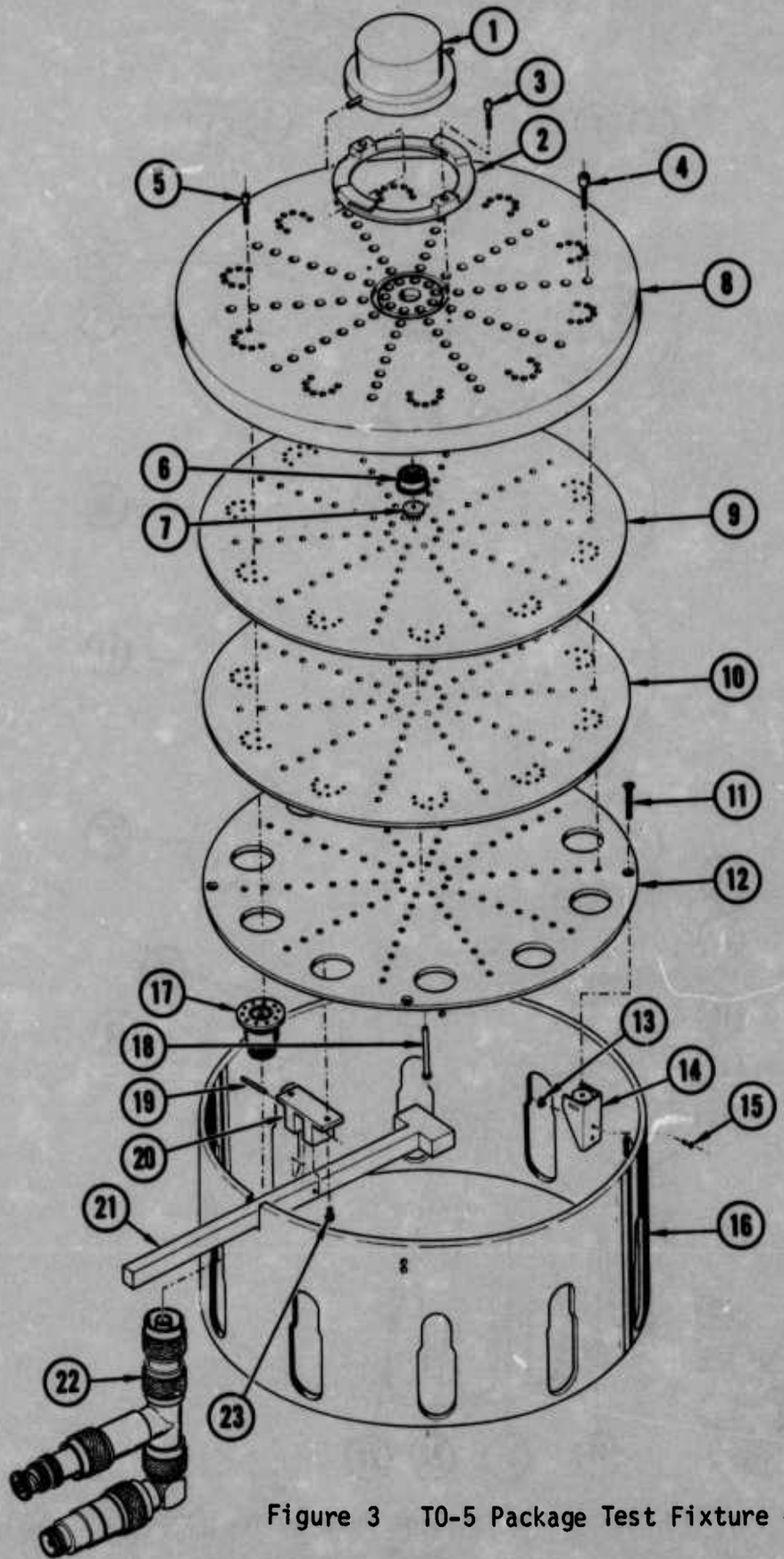


Figure 3 TO-5 Package Test Fixture - Exploded View

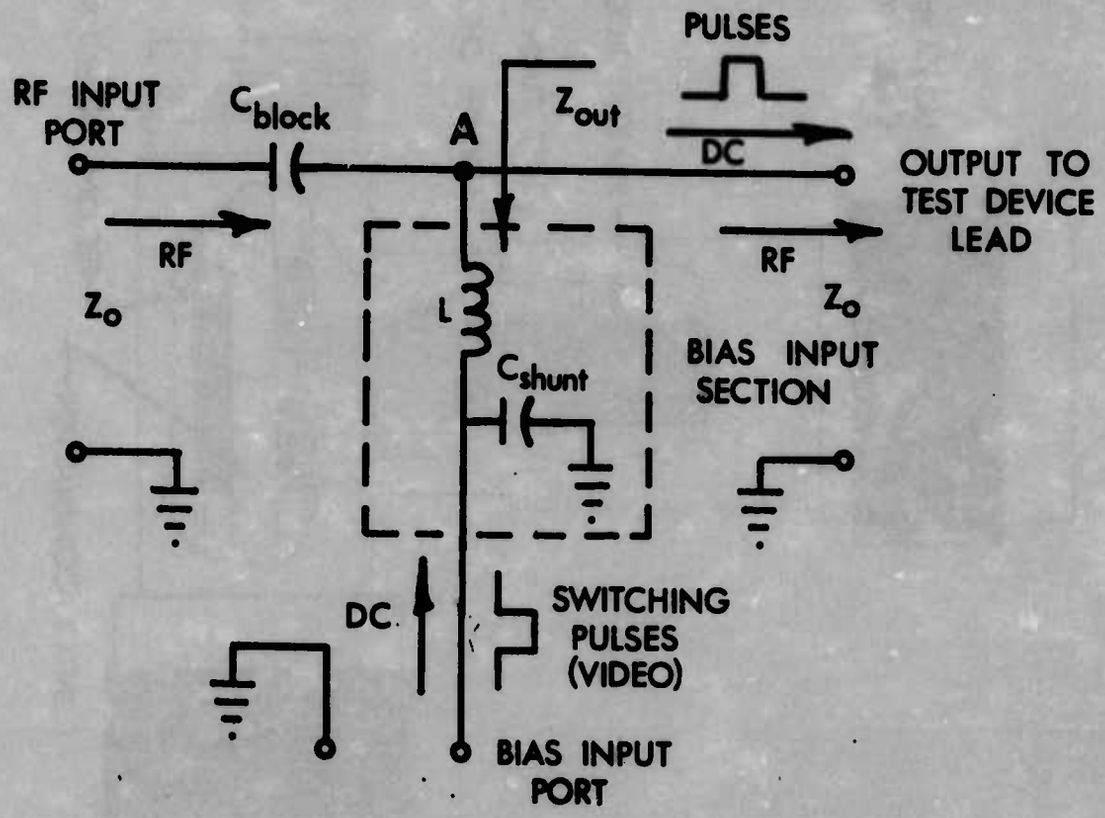


Figure 4 Bias Unit With 2 1/2 Turn Ferrite Choke

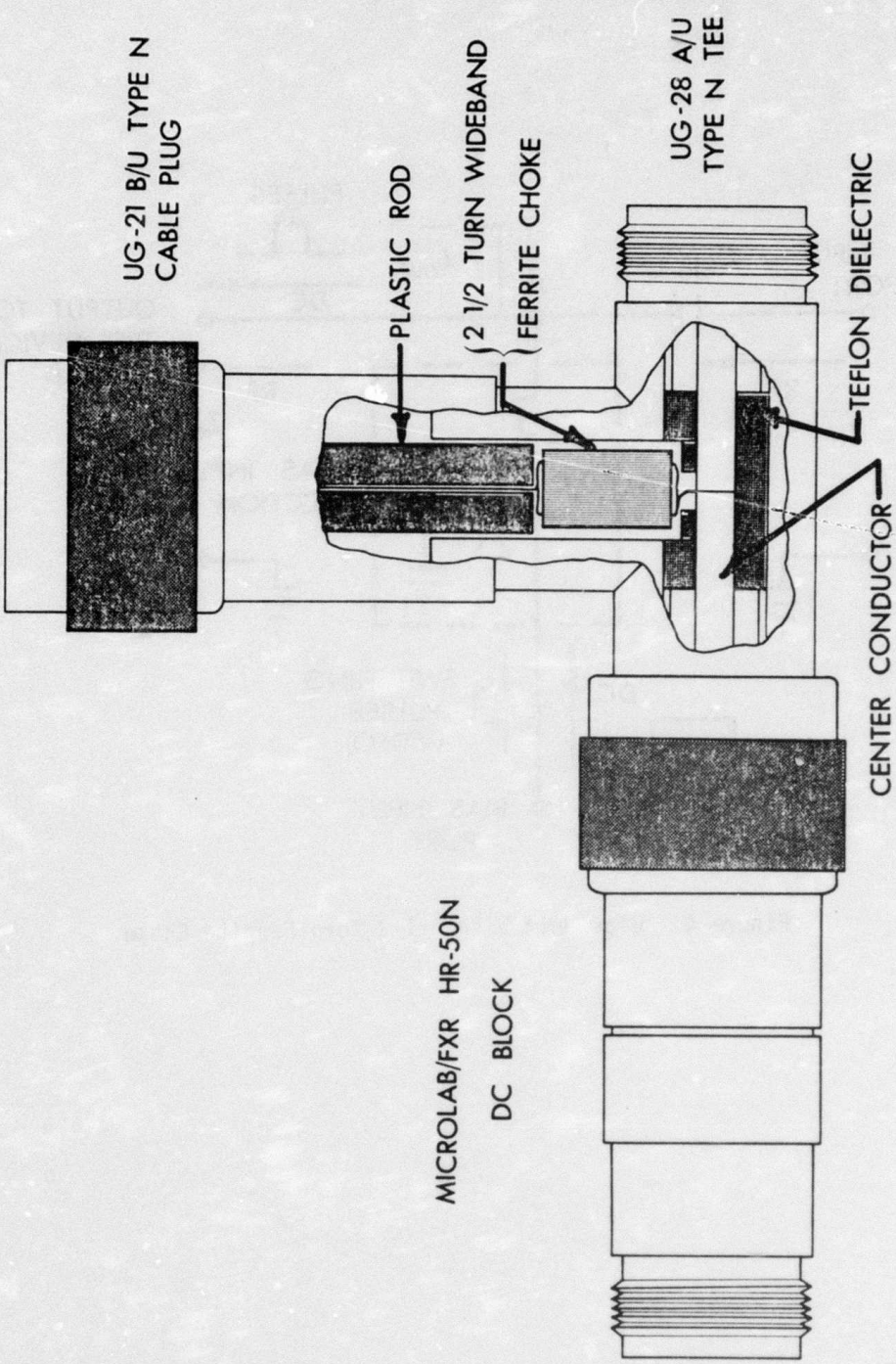
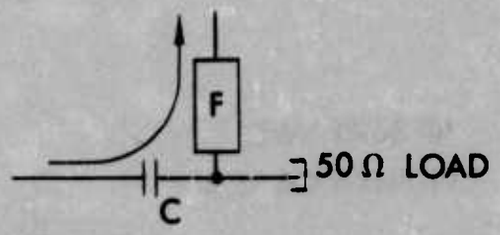


FIGURE 5 CUTAWAY DRAWING OF THE ASSEMBLED BIAS UNIT



C: FXR HR–50 N

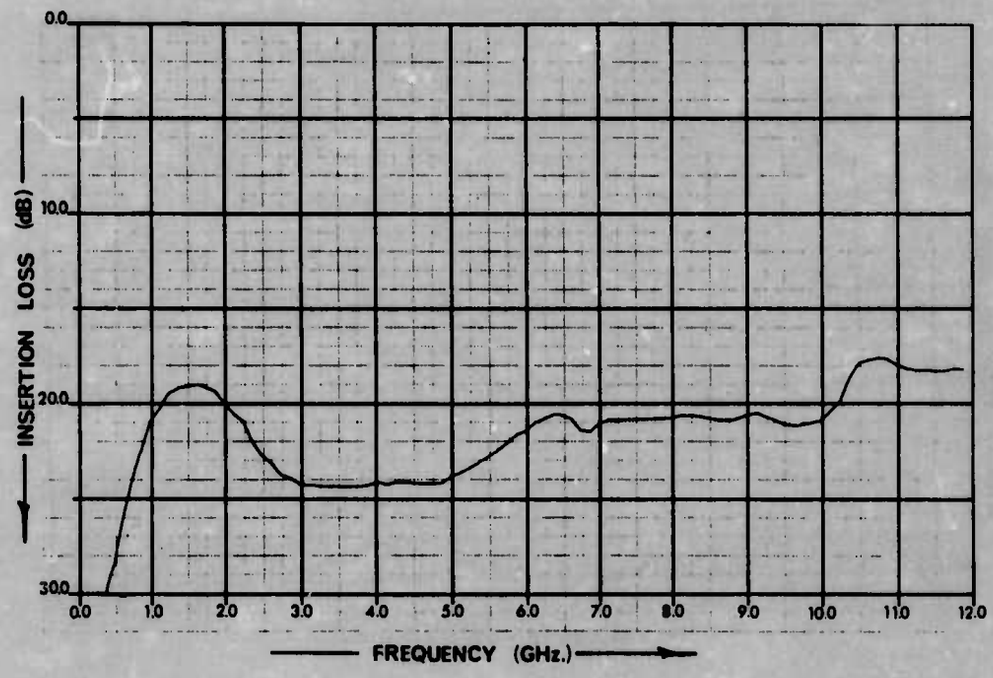


FIGURE 6 RF ISOLATION FROM RF PATH TO BIAS INPUT PORT

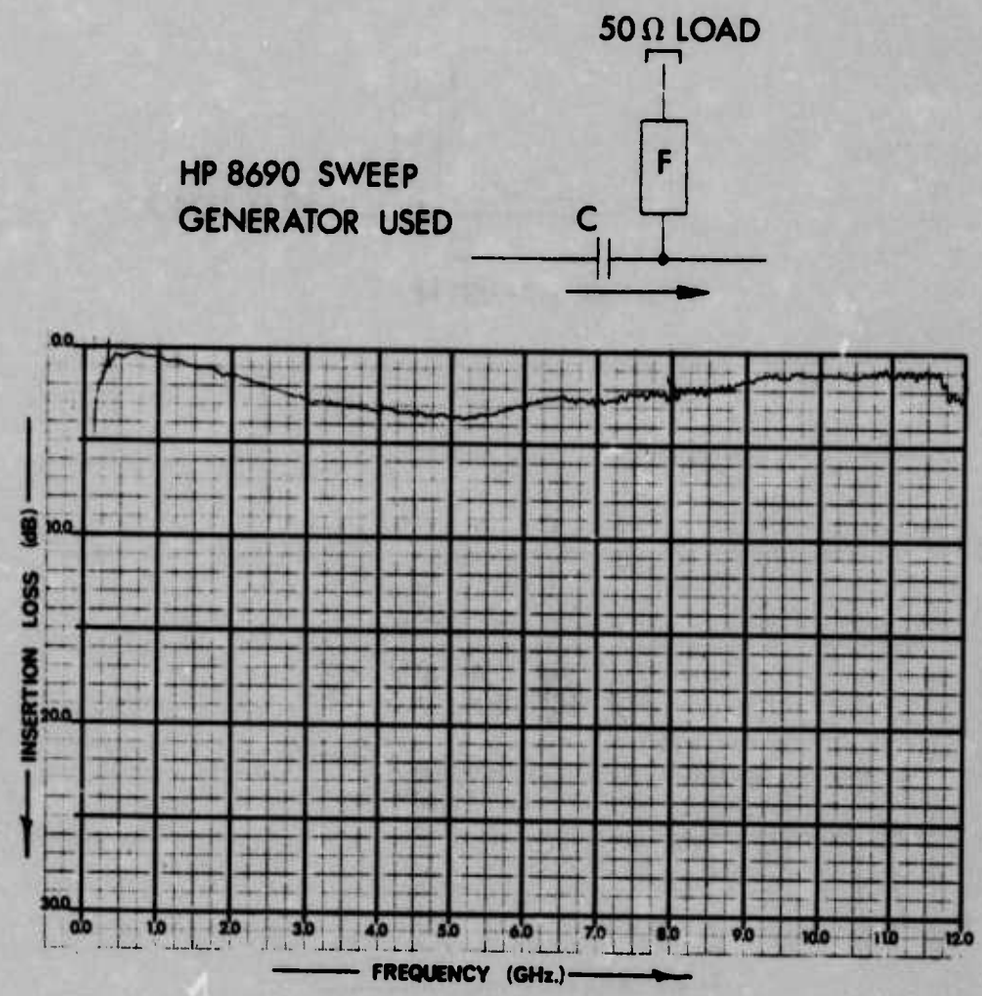


FIGURE 7 BIAS UNIT RF PATH INSERTION LOSS

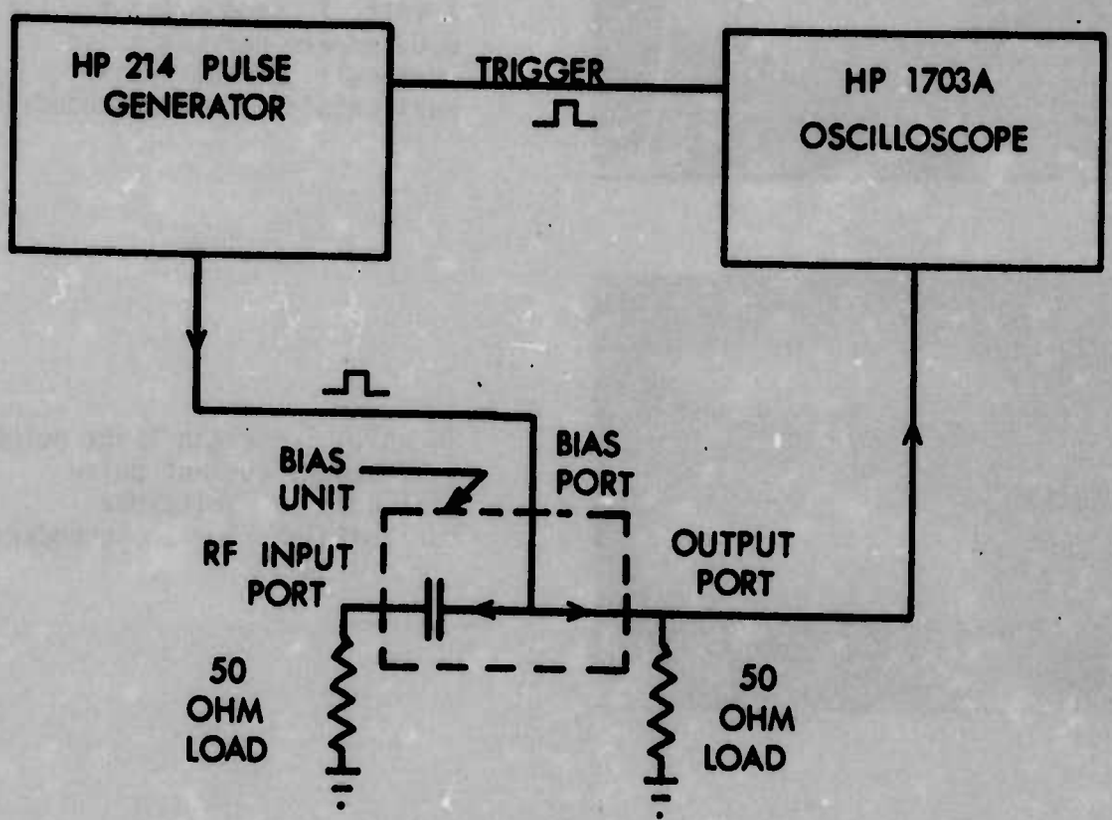
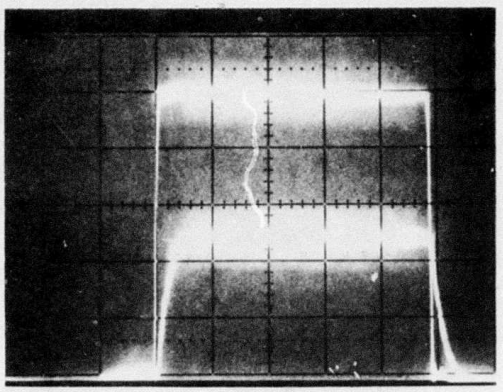
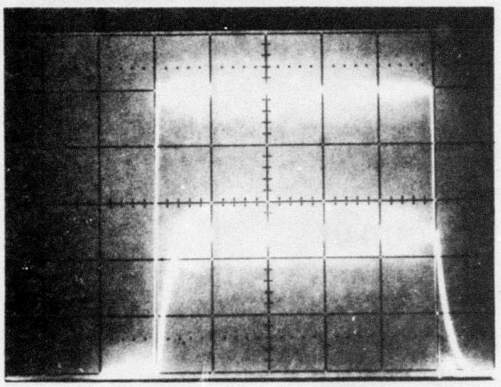


FIGURE 8 SETUP USED TO MEASURE CURRENT SATURATION EFFECTS UPON THE 2 1/2 TURN FERRITE CHOKE

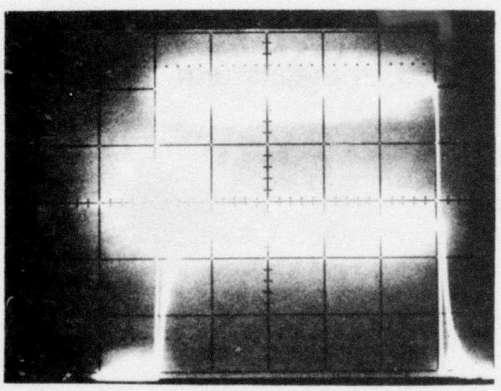


Top pulses in each photograph are input pulses to the bias unit. The bottom pulses are the output pulses from the bias unit's output port. All pulses are delivered to a 25 ohm load.

1 volt, 1 μsecond input pulse
0.01 ampere current pulse
vertical: .20 volts/div
horizontal: 200 nanoseconds/div

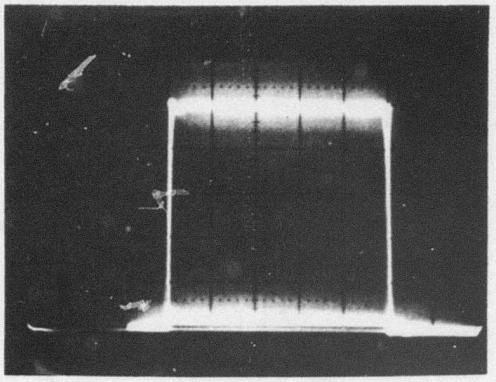


10 volt, 1 μsecond input pulse
0.10 ampere current pulse
vertical: 2 volts/div
horizontal: 200 nanoseconds/div



100 volt, 1 μsecond input pulse
1.0 ampere current pulse
vertical: 20 volts/div
horizontal: 200 nanoseconds/div.

FIGURE 9 SATURATION EFFECTS FROM HIGH CURRENT LEVELS UPON THE FERRITE CHOKE



Vertical: 2 Volts/div
0.08 amp/div

Horizontal: 200 nanosecond per div.

Upper trace: open circuit voltage available from generator

Lower trace: voltage delivered to RF generator

FIGURE 10 ISOLATION OF THE RF GENERATOR FROM INPUT PULSES DUE TO THE MICROLAB/FXR DC BLOCKS CAPACITIVE REACTANCE

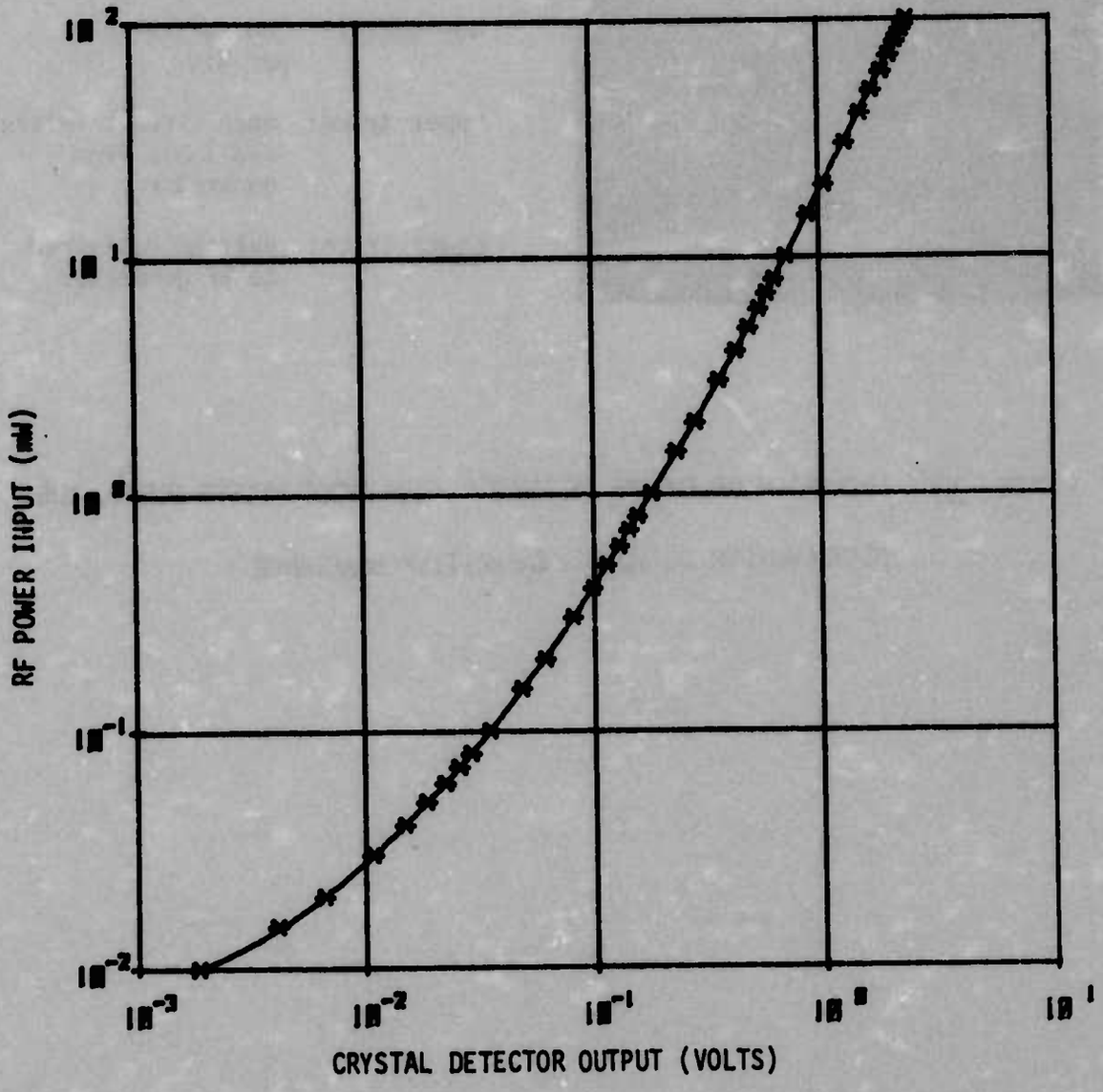


FIGURE 11 TYPICAL CRYSTAL CALIBRATION CURVE

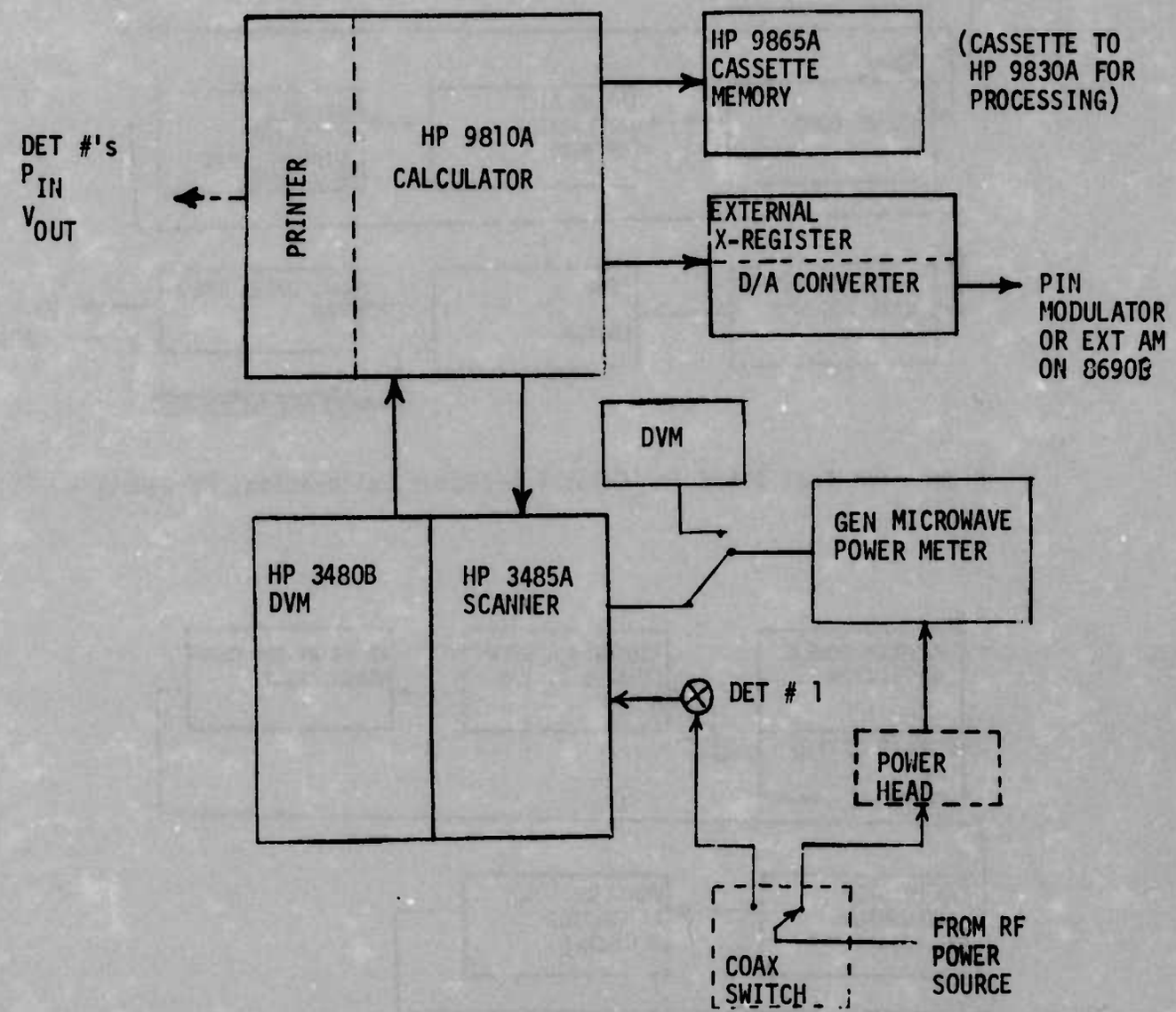


Figure 12 GENERAL TEST SETUP FOR CRYSTAL DETECTOR CALIBRATION

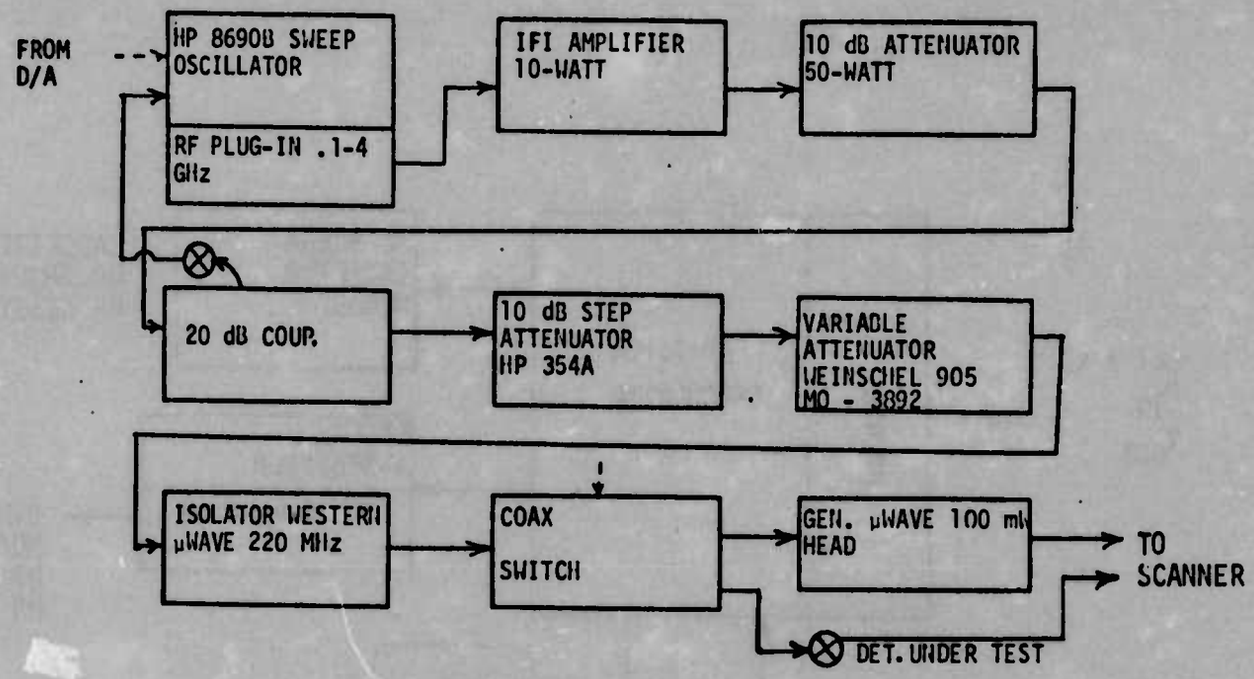


Figure 13 Test Setup for Crystal Detector Calibration, Frequency = .22 GHz

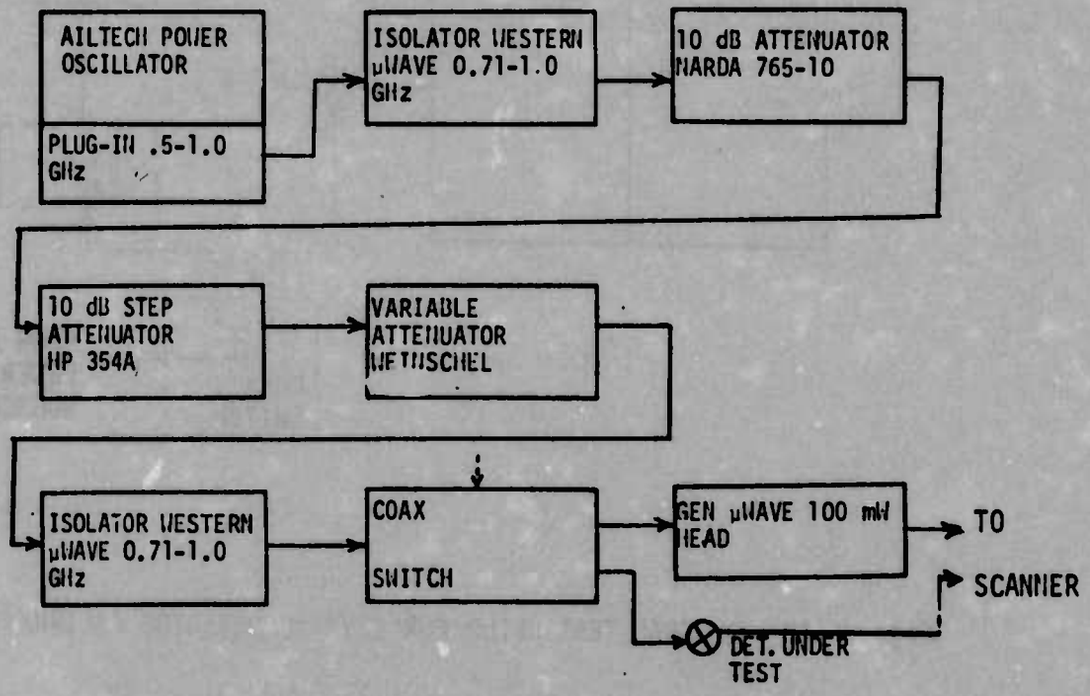


Figure 14 Test Setup for Crystal Detector Calibration, Frequency = 0.91 GHz

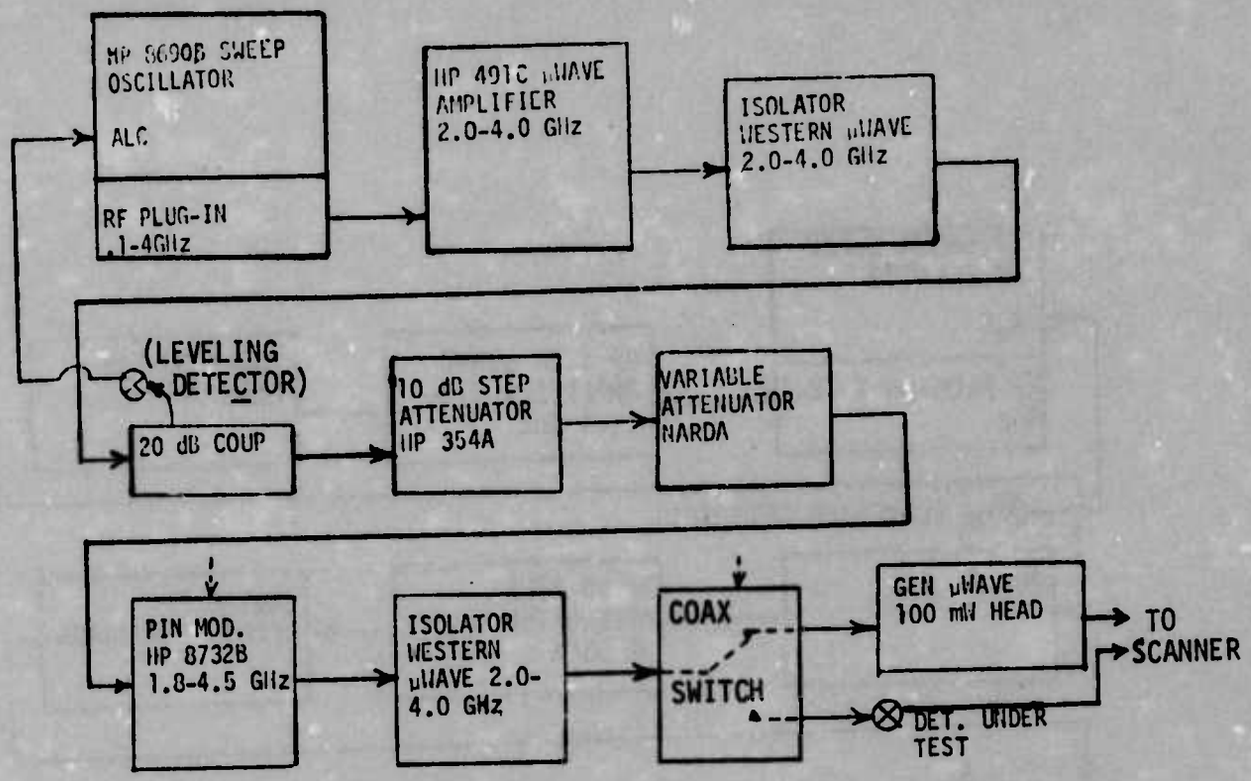


Figure 15 Test Setup for Crystal Detector Calibration, Frequency = 3 GHz

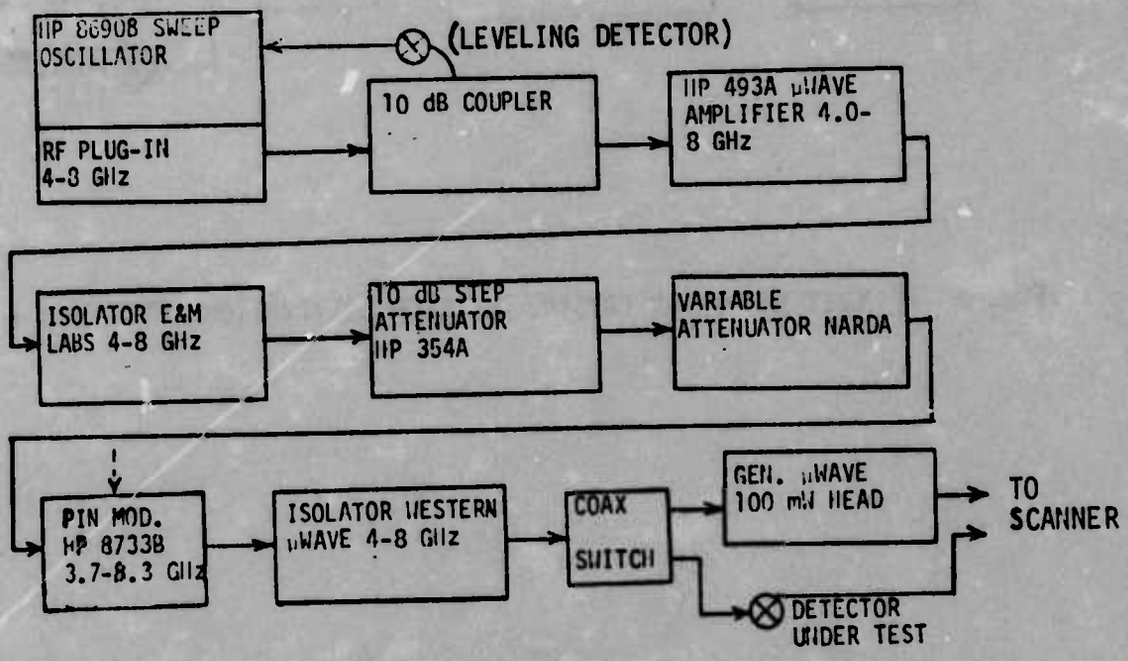


Figure 16 Test Setup for Crystal Detector Calibration, Frequency = 5.6 GHz

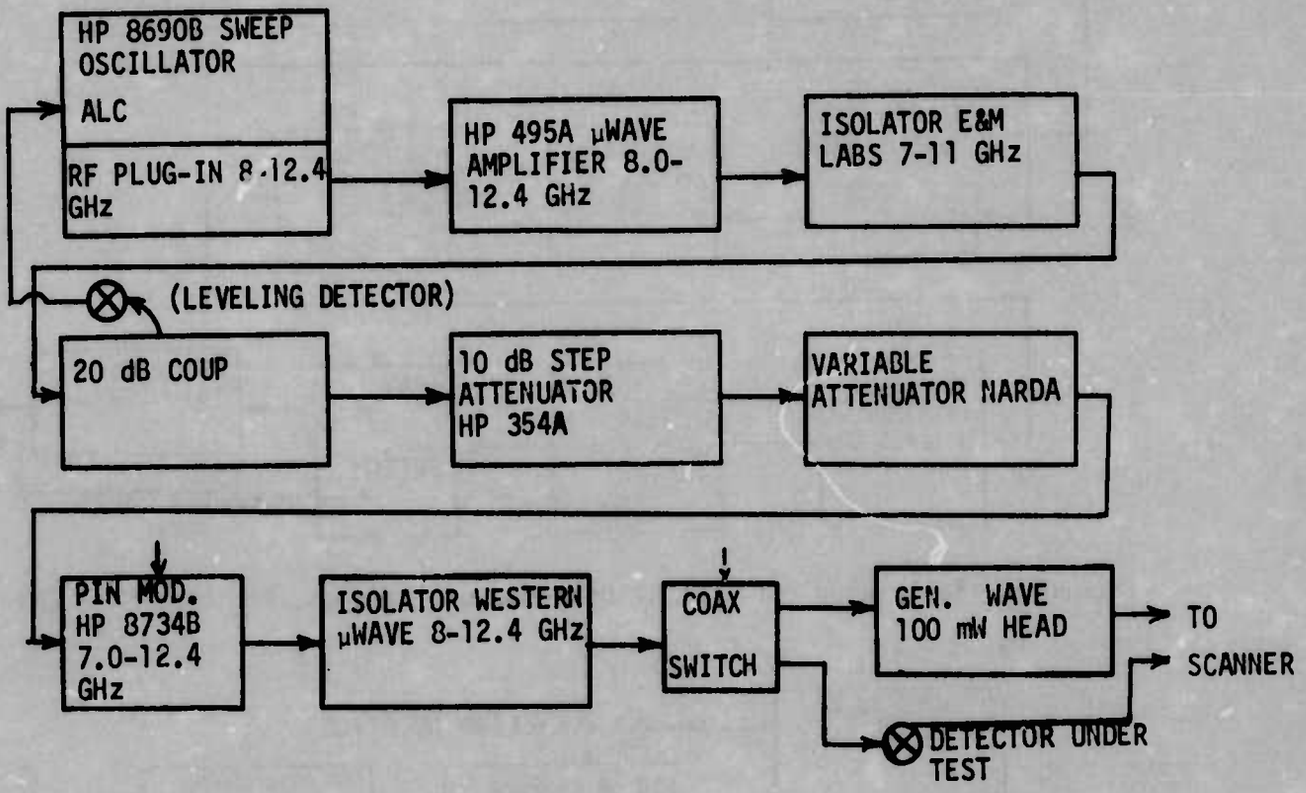
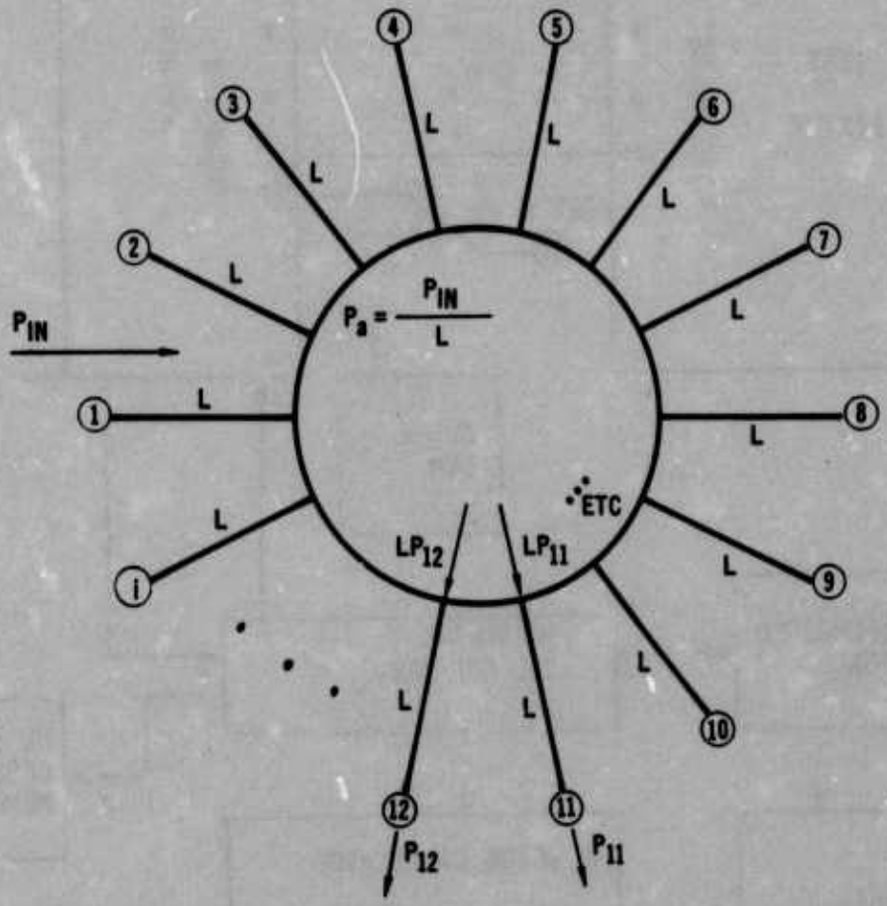


Figure 17 TEST SETUP FOR CRYSTAL DETECTOR CALIBRATION, FREQUENCY = 9.1 GHz



P_a – POWER AVAILABLE FOR DISTRIBUTION TO OUTPUT PORTS

P_j – POWER MEASURED OUT OF J'TH PORT

$$P_a = \frac{P_{IN}}{L} \quad = \sum_{j=1}^{i} LP_j \text{ HENCE, } L^2 = \frac{P_{IN}}{\sum_{j=1}^{i} P_j}$$

FIGURE 18 DETERMINATION OF FIXTURE DISSIPATION LOSS

A

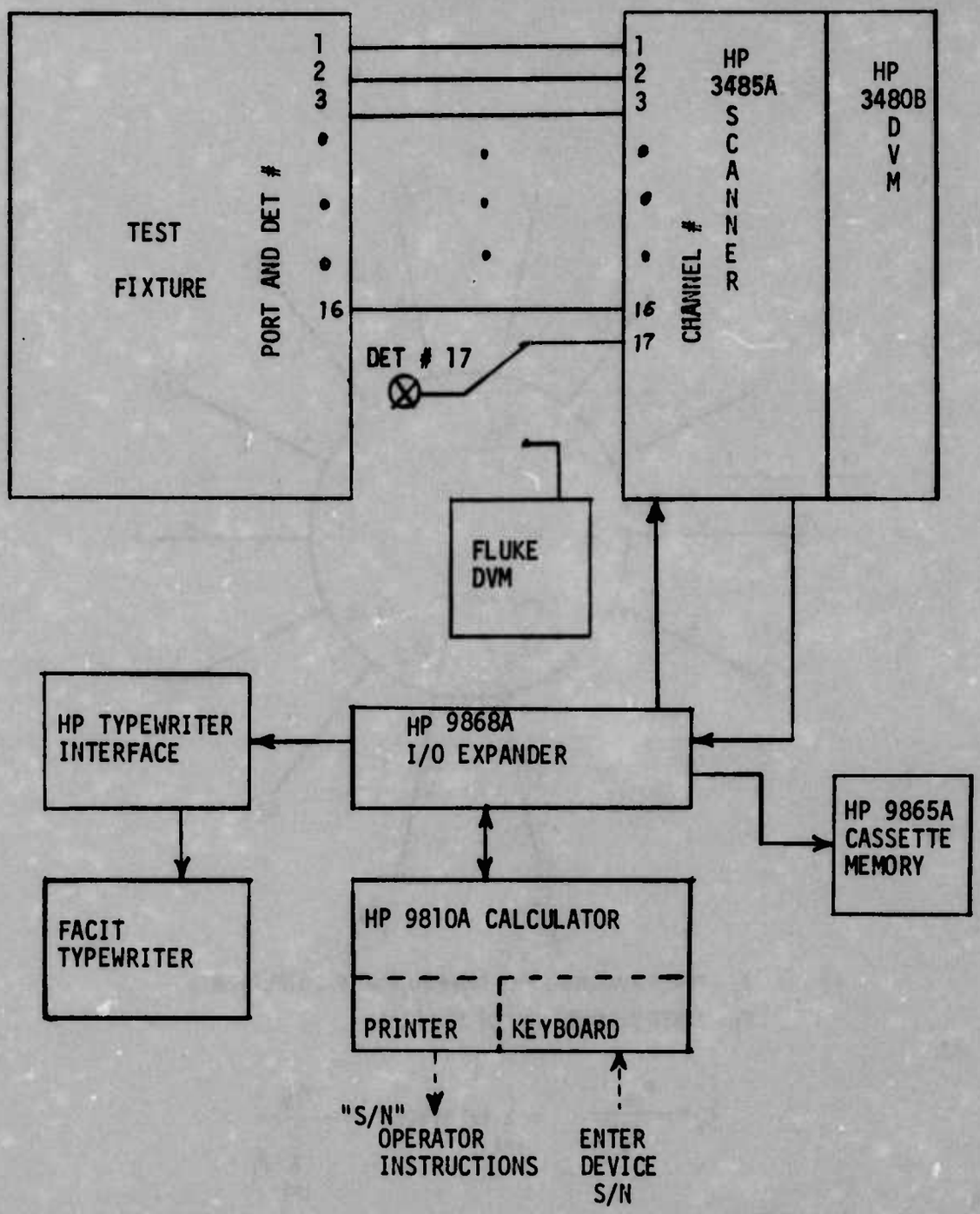


Figure 19 HP 9810A DATA SYSTEM FOR ALL FREQUENCIES FOR FIXTURE CALIBRATION

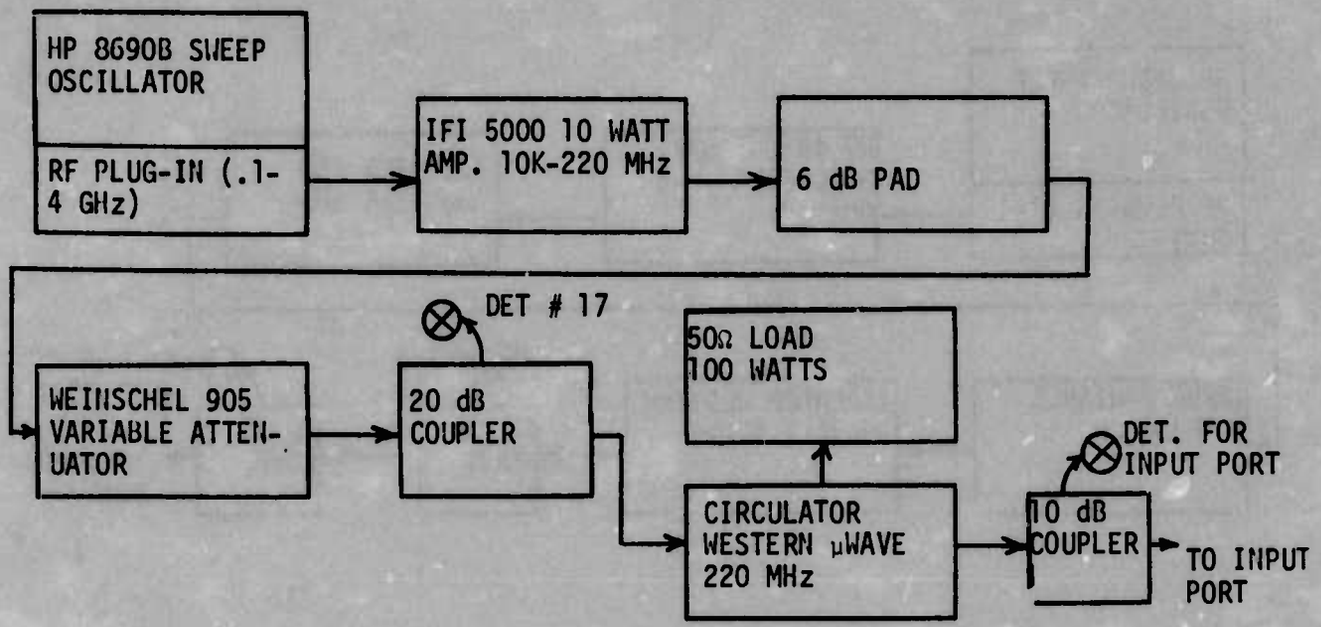


Figure 20 RF SETUP FOR FIXTURE CALIBRATION f = 0.22 GHz

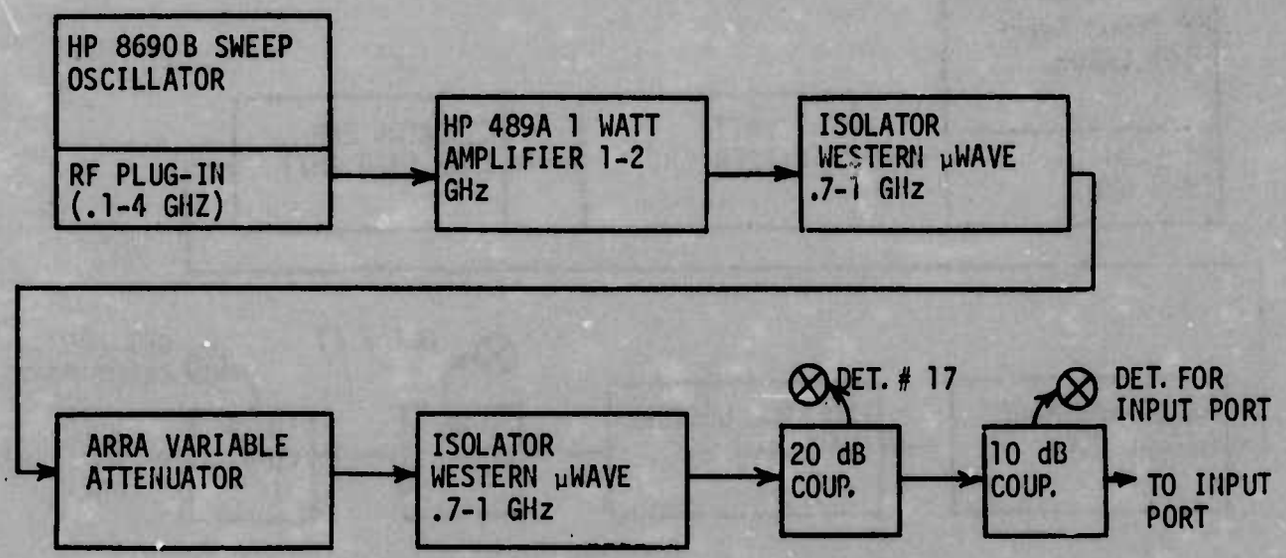


Figure 21 RF SETUP FOR FIXTURE CALIBRATION f = 0.91 GHz

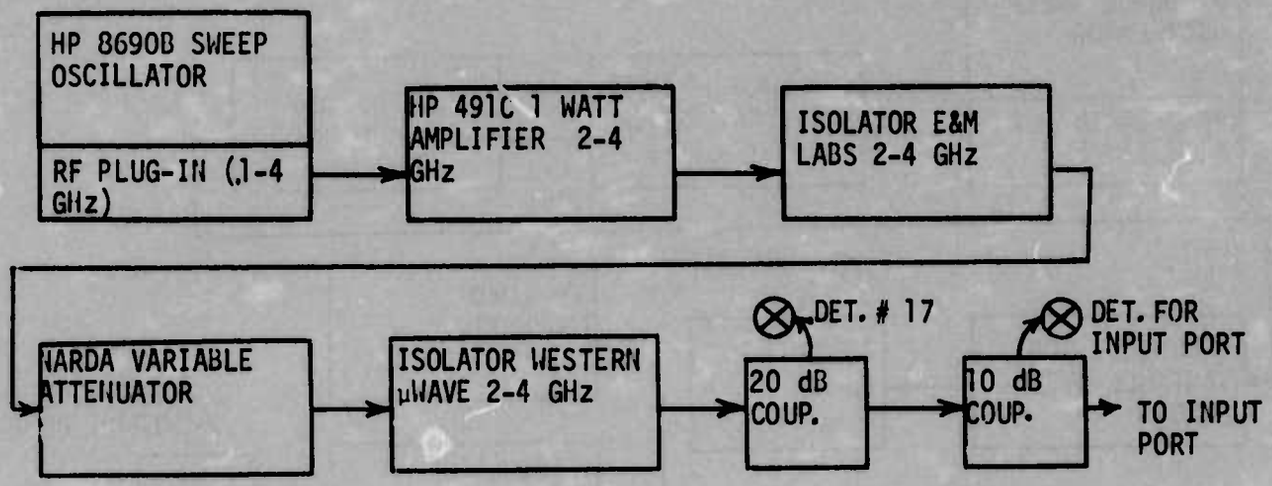


Figure 22 RF SETUP FOR FIXTURE CALIBRATION f = 3.0 GHz

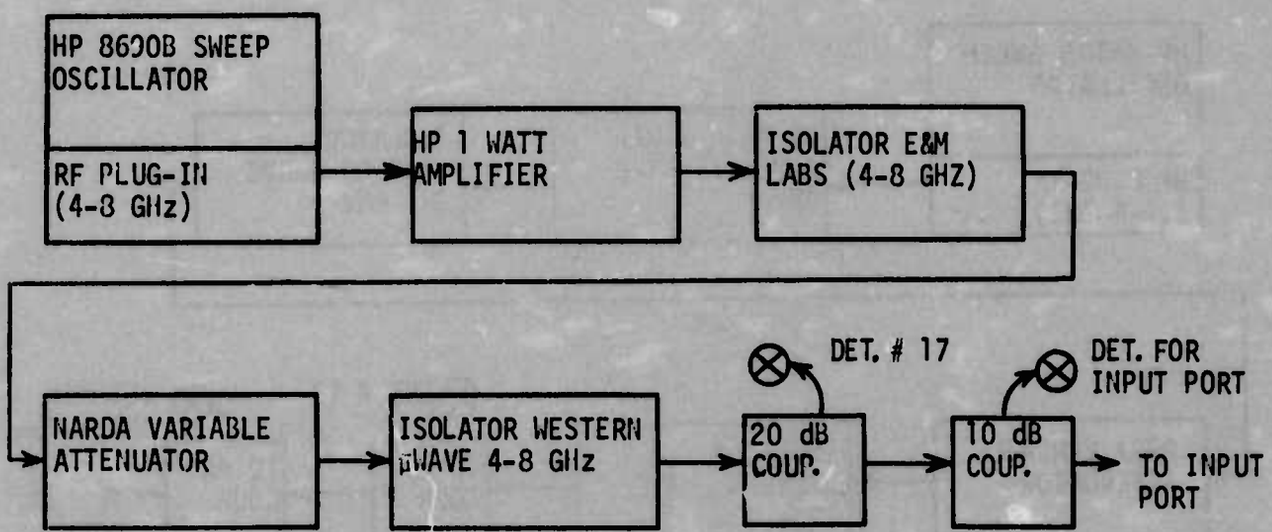


Figure 23 RF SETUP FOR FIXTURE CALIBRATION f = 5.6 GHz

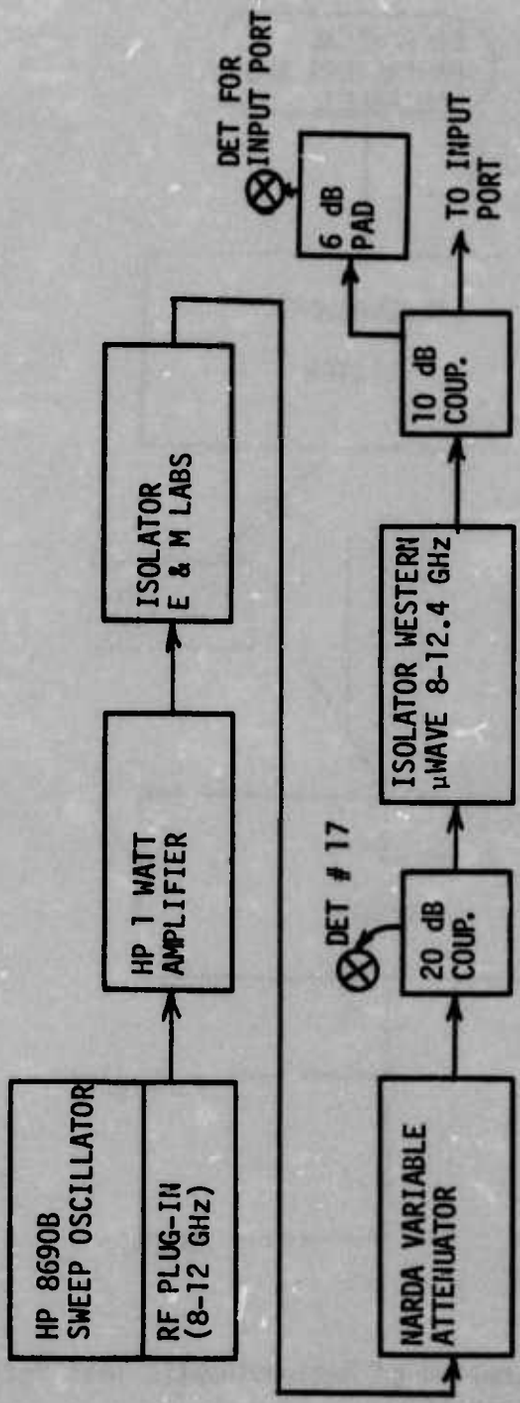


Figure 24 RF SETUP FOR FIXTURE CALIBRATION f = 9.1 GHz

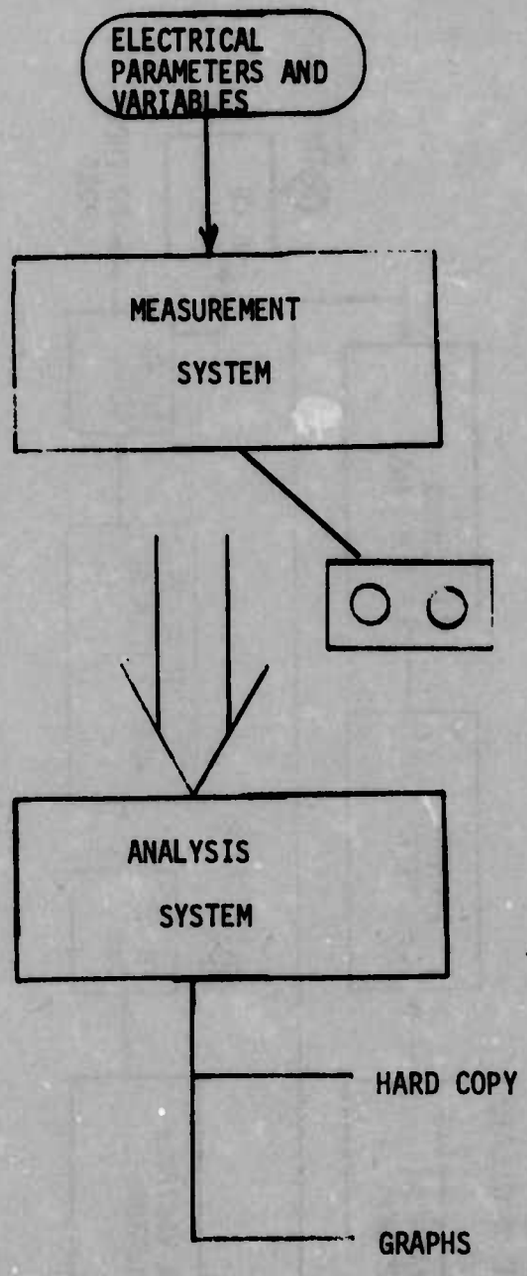
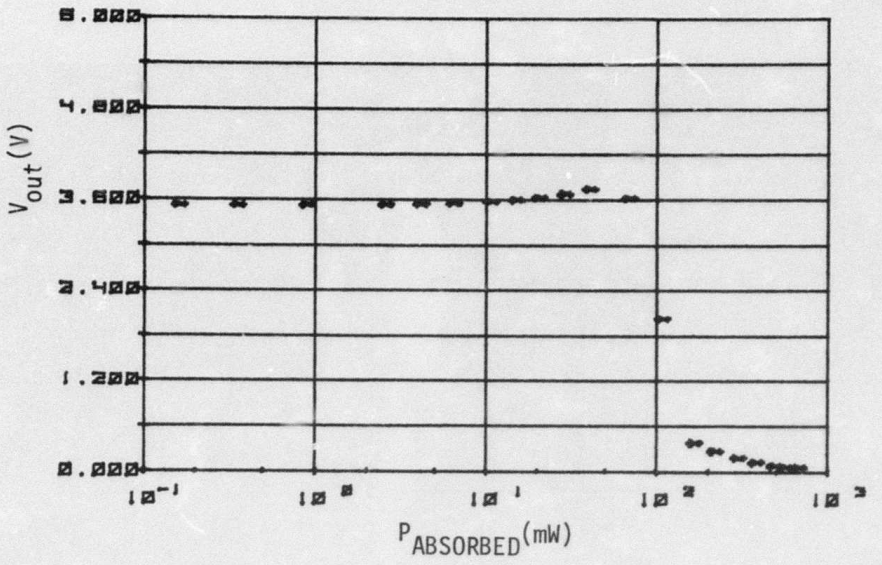


Figure 25 Illustration of Semi-Automatic Test System Measurement and Analysis



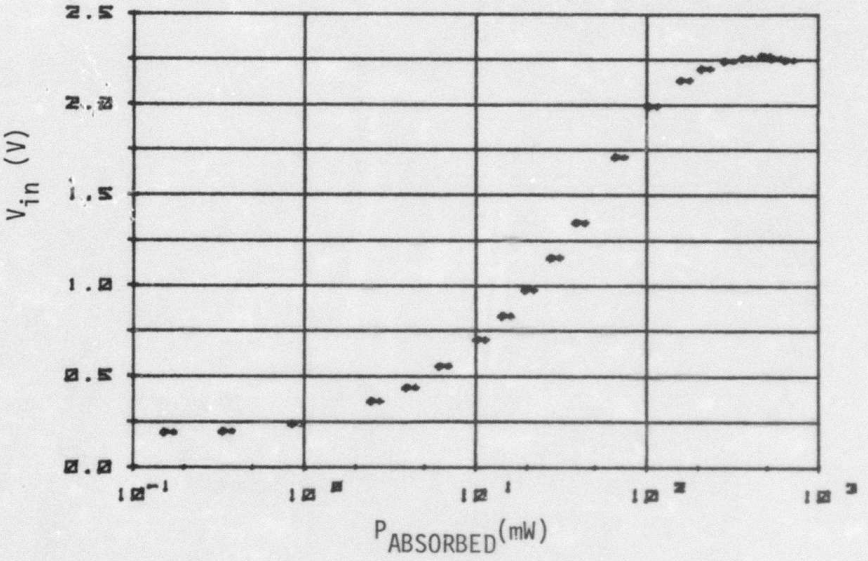


FIGURE 26 EXAMPLES OF V_{OUT} AND V_{IN} VS $P_{ABSORBED}$,
RF INJECTED INTO INPUT PORT OF 7400 DEVICE.
INPUT LOW, OUTPUT HIGH BIAS STATE. 220 MHz

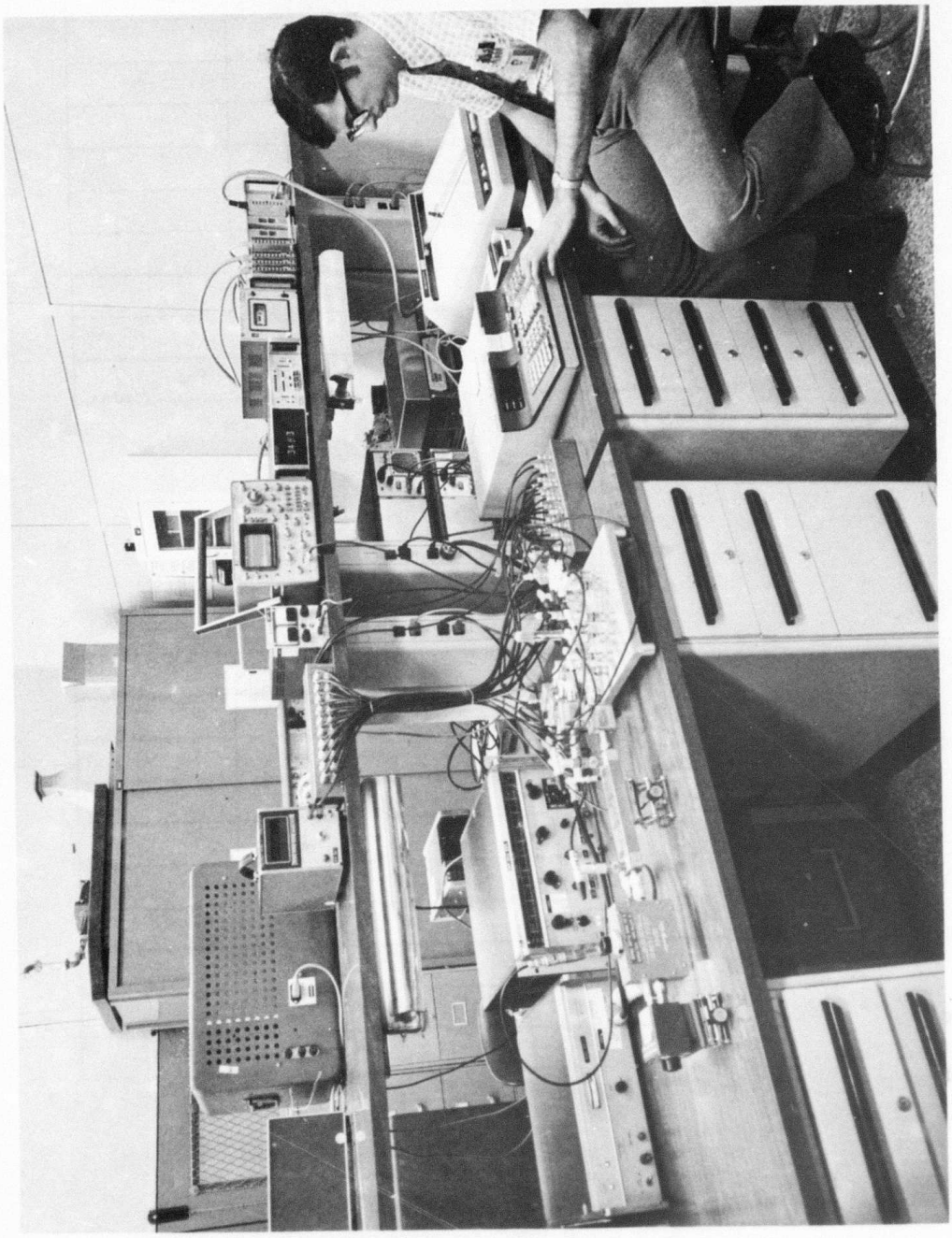


FIGURE 27 SE11-AUTOMATED MEASUREMENT TEST SETUP

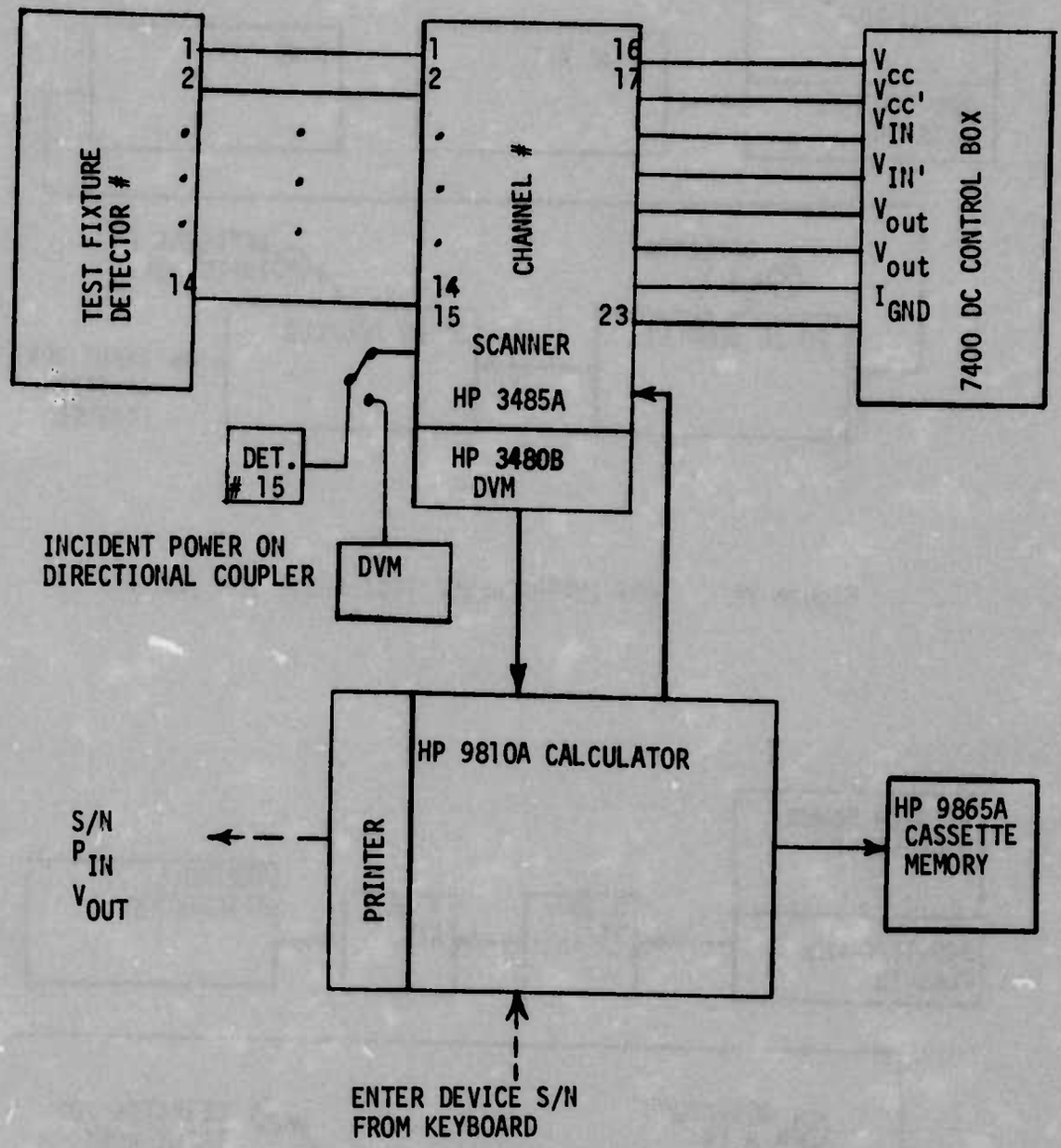


Figure 28 GENERAL TEST SETUP FOR 7400 INTERFERENCE TESTING

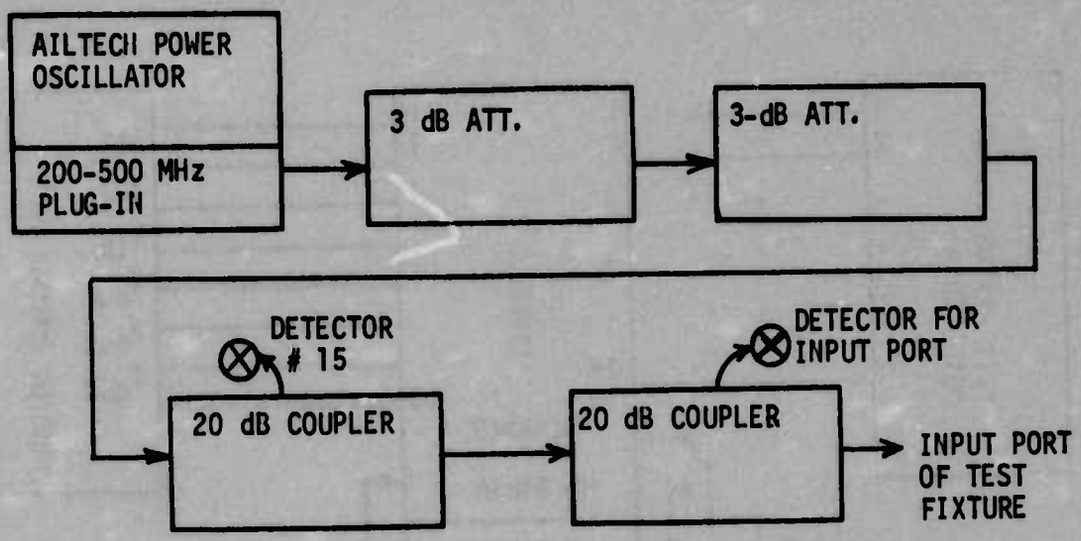


Figure 29 7400 INTERFERENCE TEST SETUP FOR .22 GHz

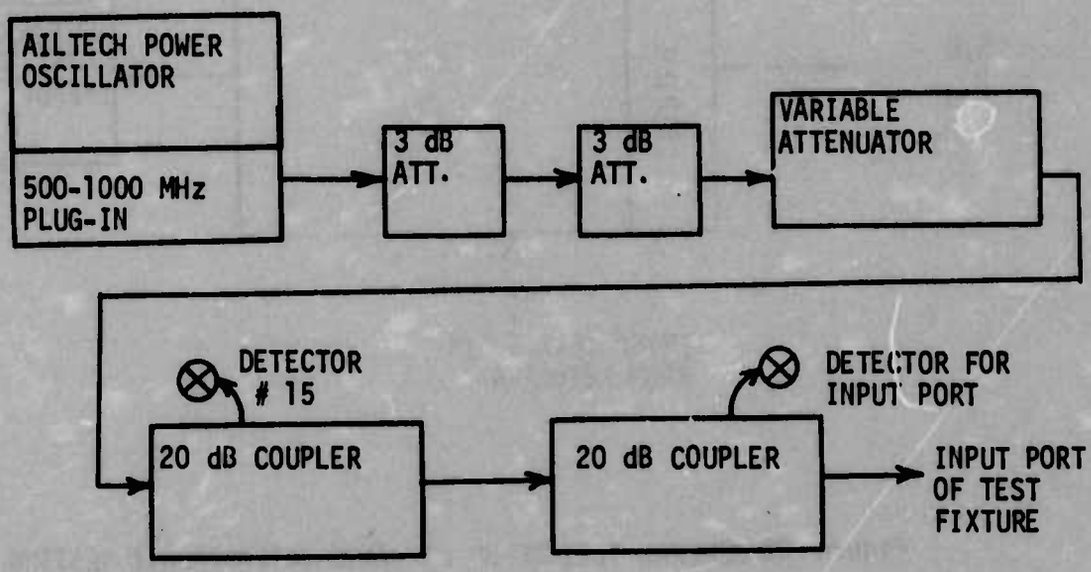


Figure 30 7400 INTERFERENCE TEST SETUP FOR .91 GHz

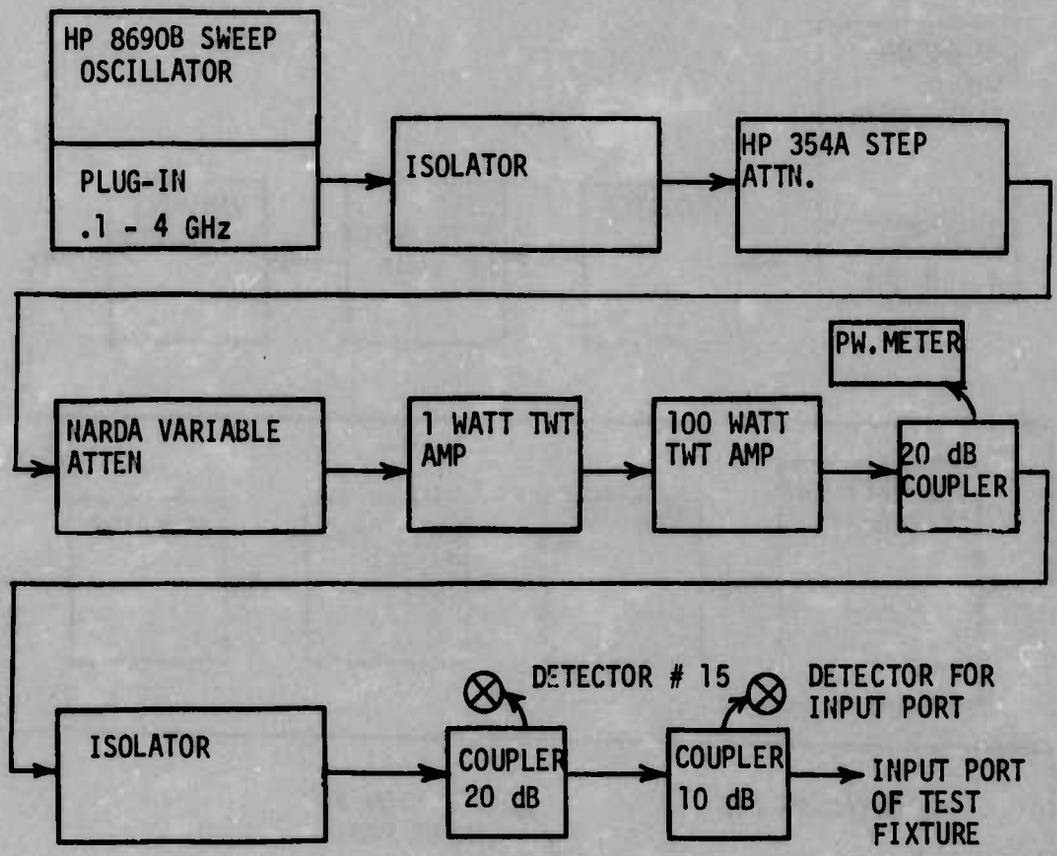


Figure 31 7400 INTERFERENCE TEST SETUP FOR 3.0 GHz

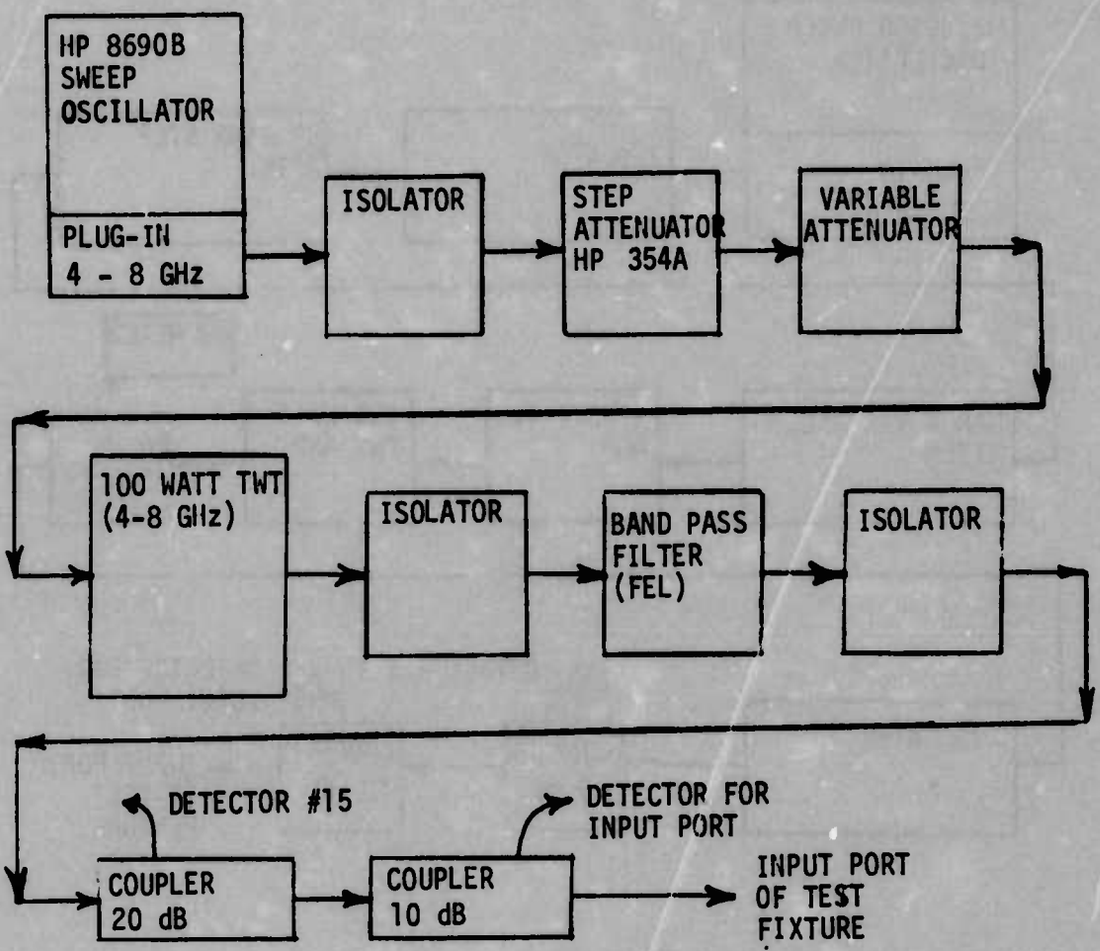
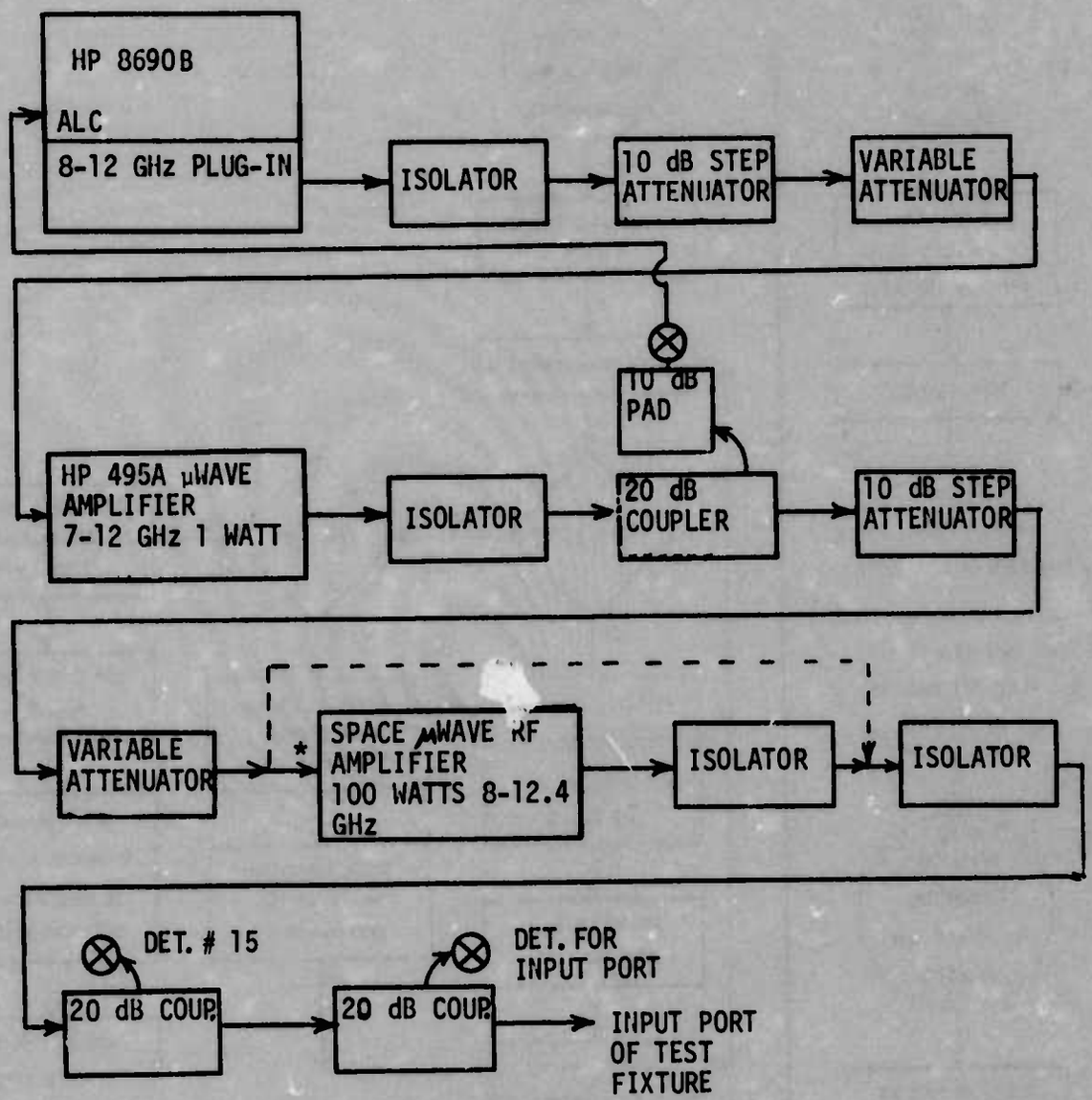


Figure 32 7400 Interference Test Setup for 5.6 GHz



* USE 100-WATT AMPLIFIER AND ISOLATOR COMBINATION ONLY AS NEEDED

Figure 33 7400 INTERFERENCE TEST SETUP FOR 9.1 GHz

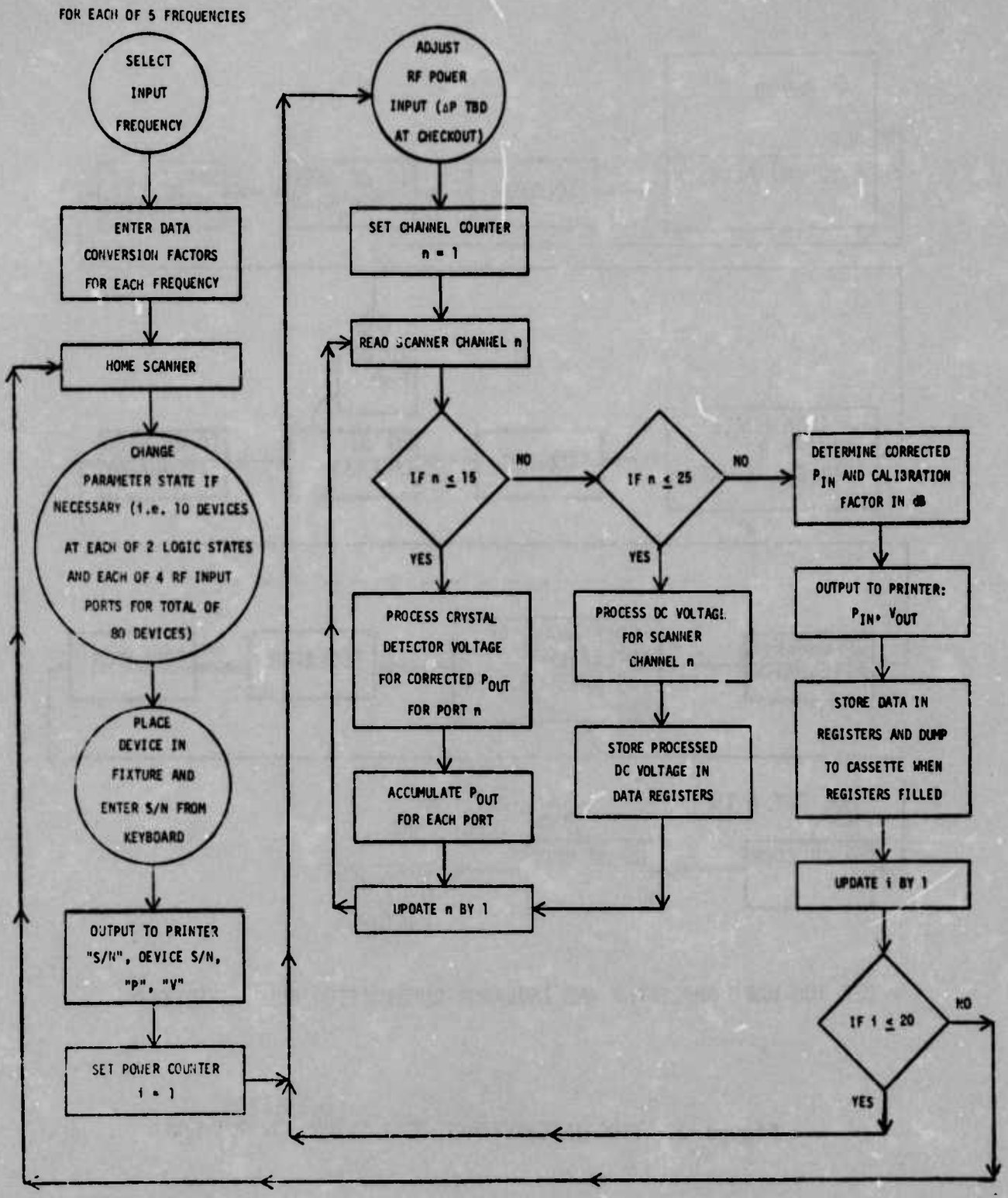


FIGURE 34 7400 INTERFERENCE TEST FLOW DIAGRAM

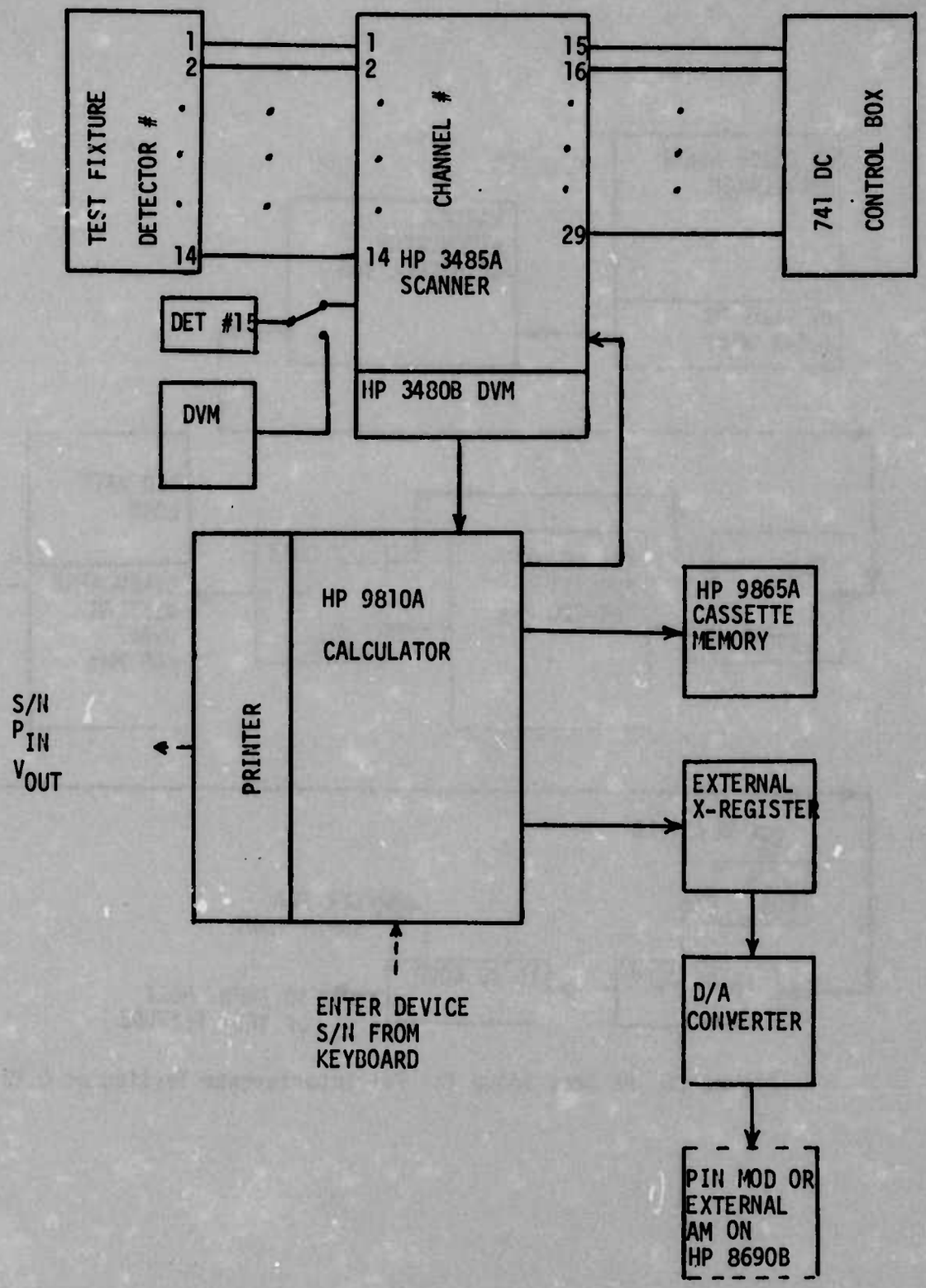


Figure 35 General Test Setup for 741 Interference Testing

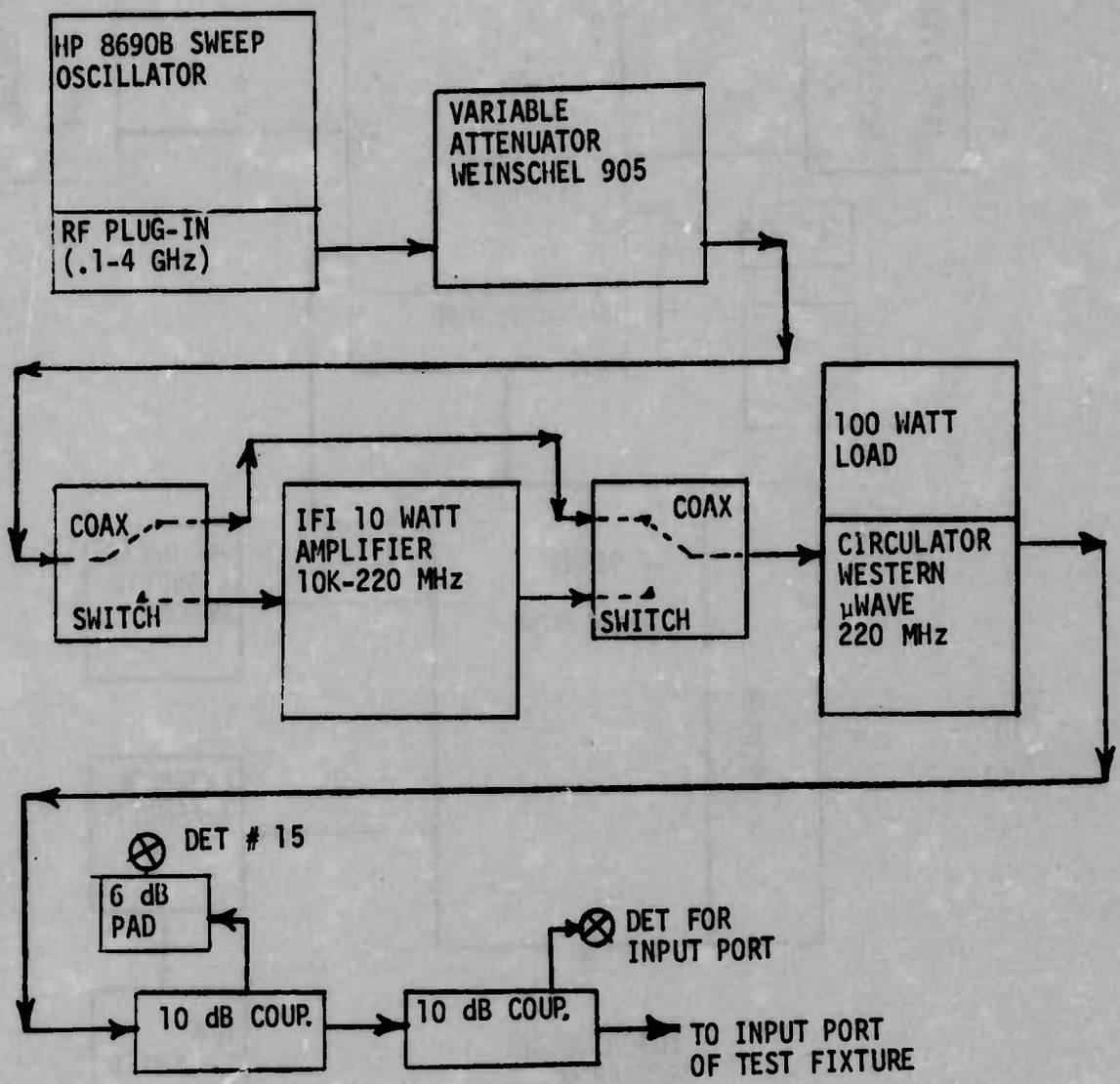


Figure 36 RF Test Setup for 741 Interference Testing at 0.22 GHz

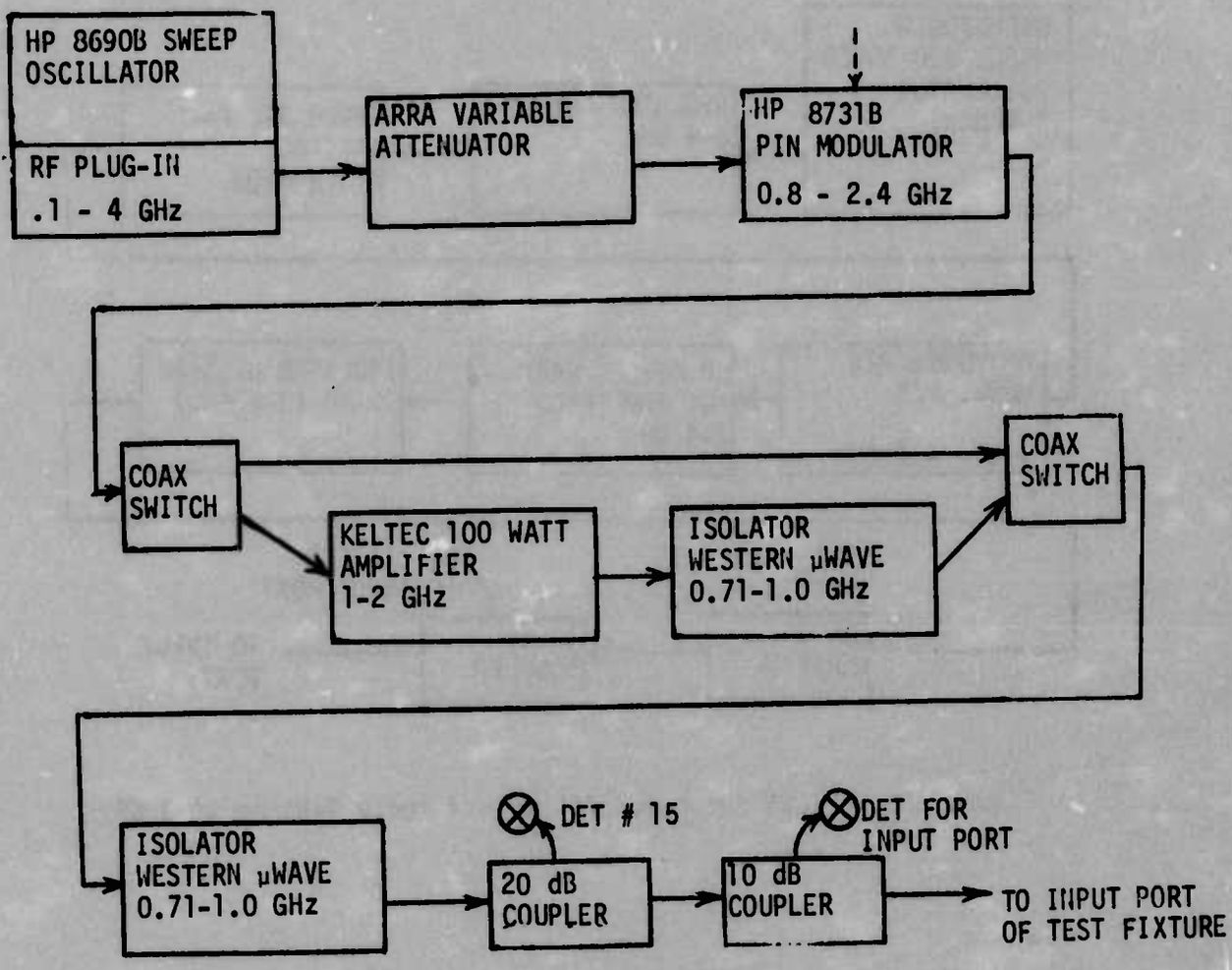


Figure 37 RF Test Setup for 741 Interference Testing at 0.91 GHz

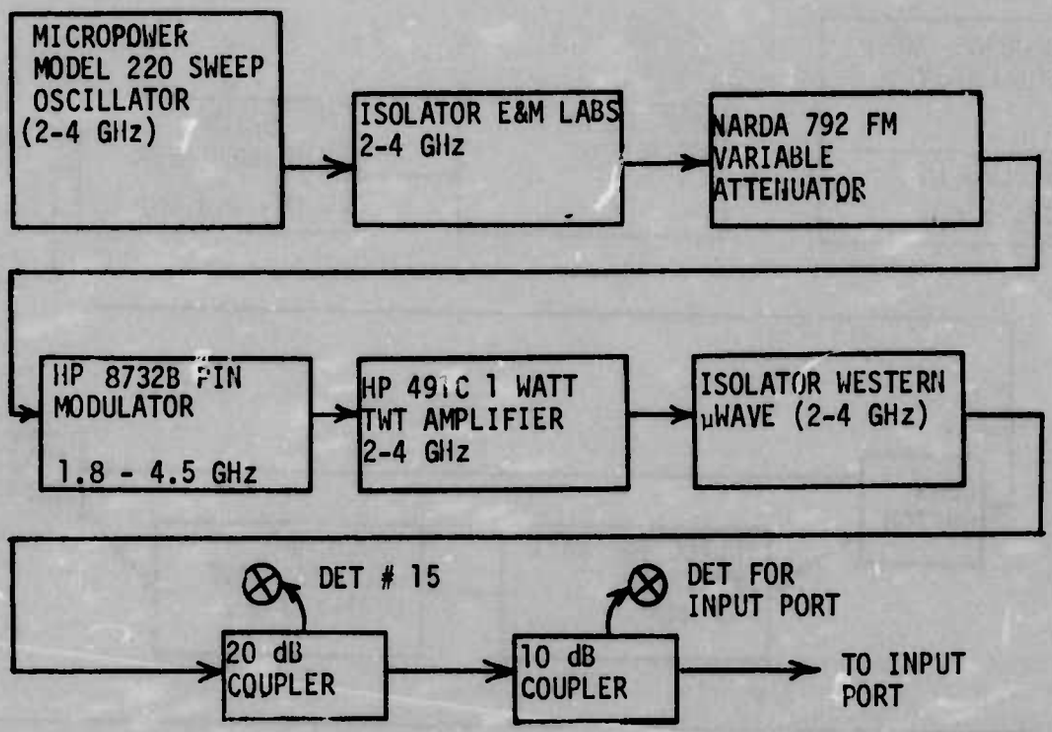


Figure 38 RF Test Setup for 741 Interference Testing at 3 GHz

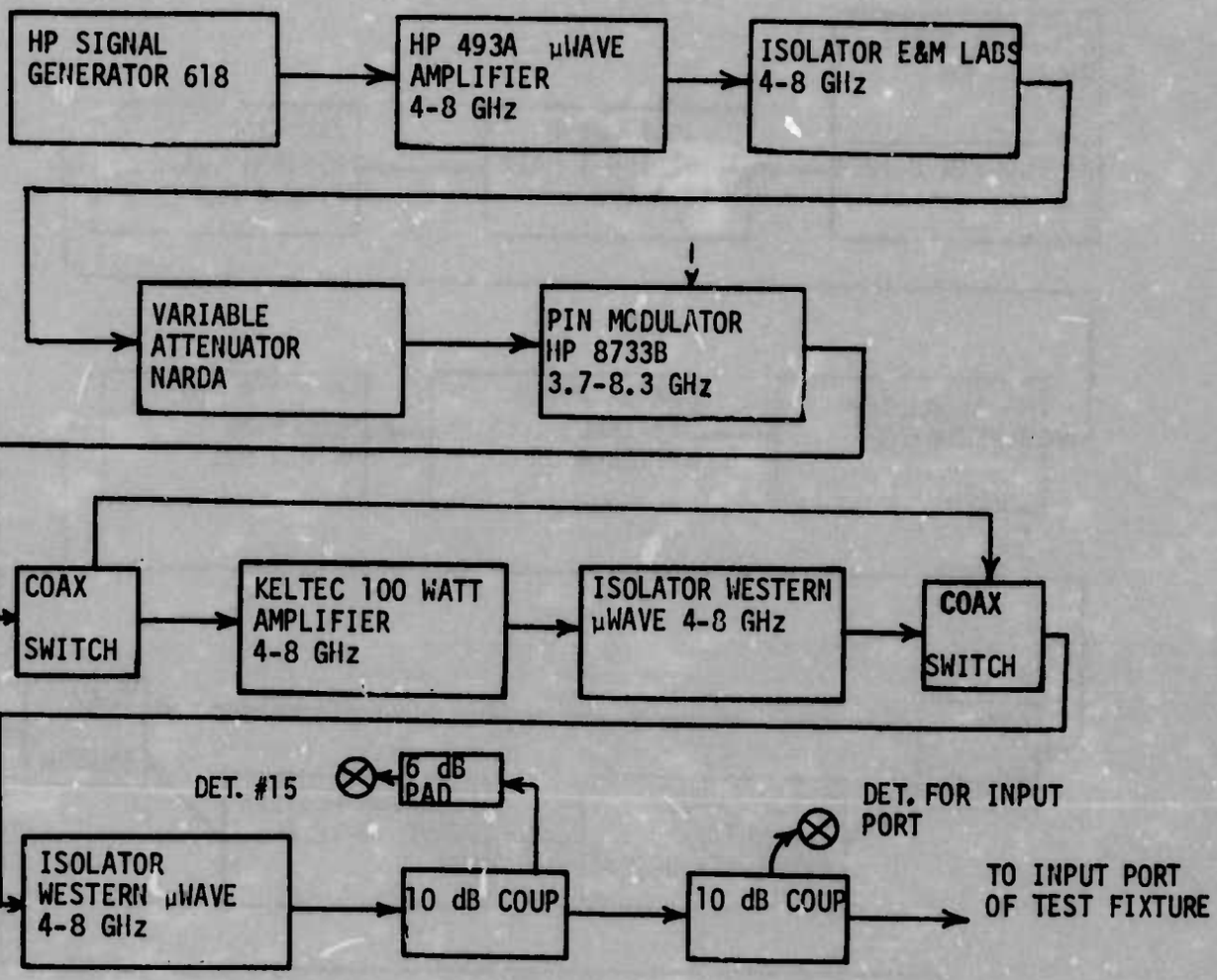


Figure 39 RF Test Setup for 741 Interference Testing at 5.6 GHz

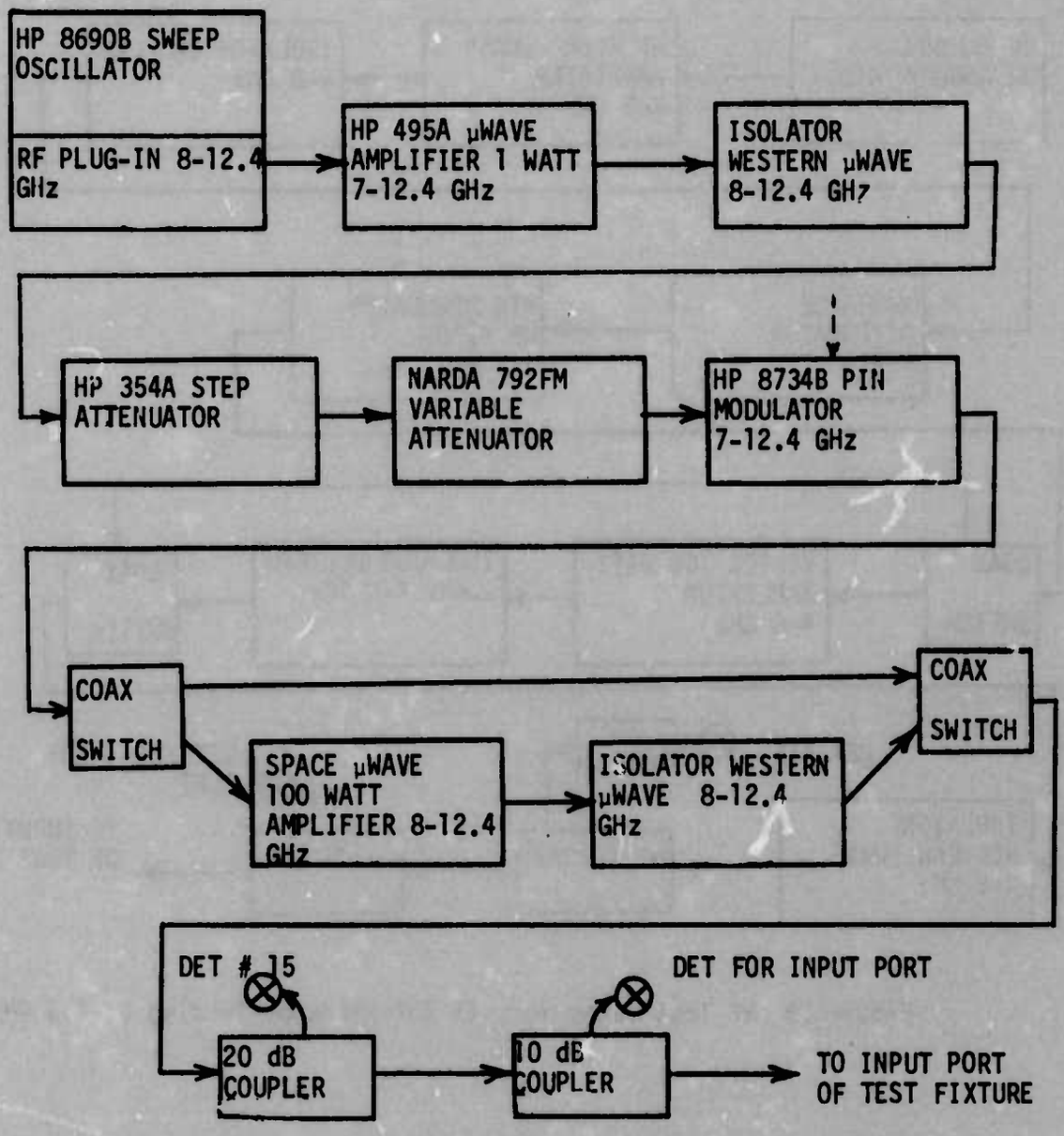


Figure 40 741 Interference Test Setup for f = 9.1 GHz

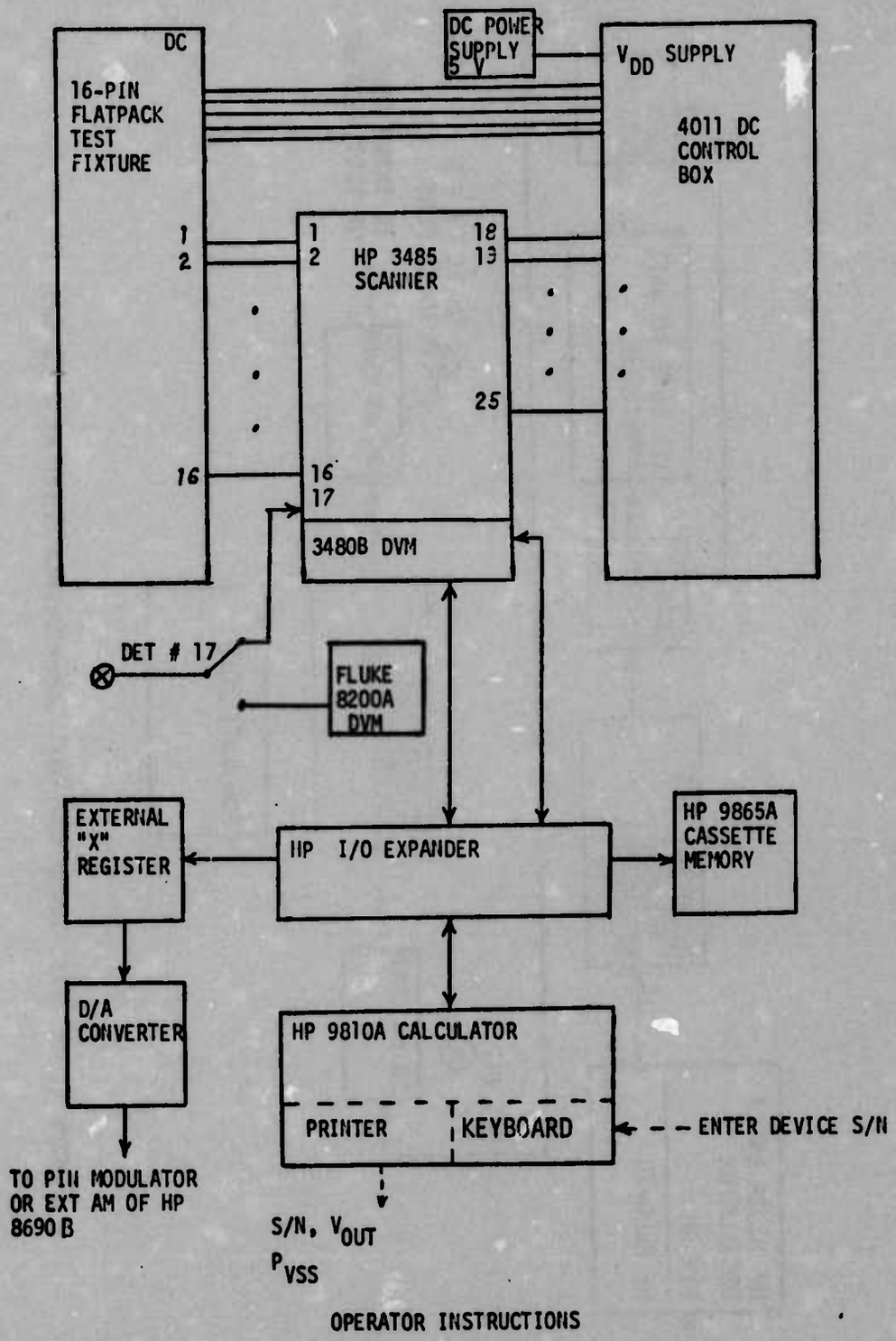


Figure 41 General Test Setup for MOS 4011 Interference Testing

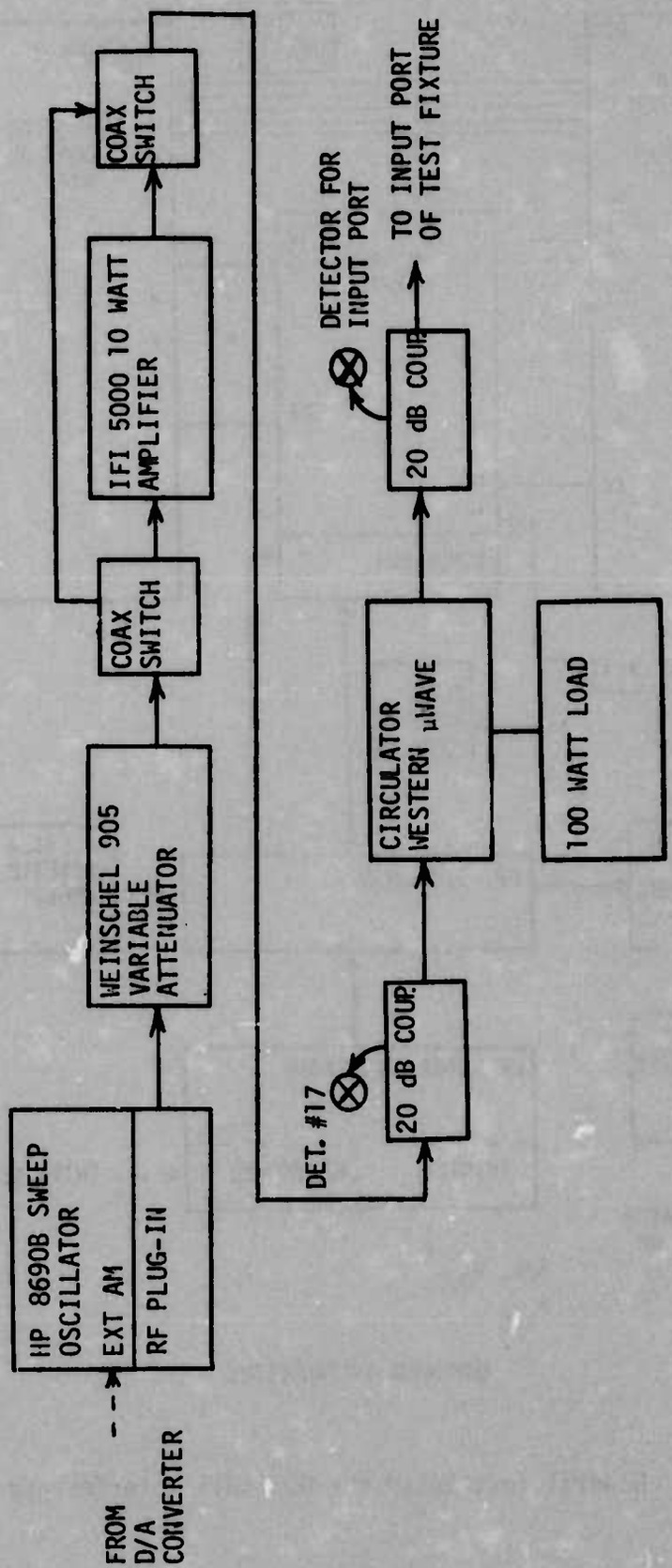


Figure 42 RF Test Setup for 4011 Interference Tests at 0.22 GHz

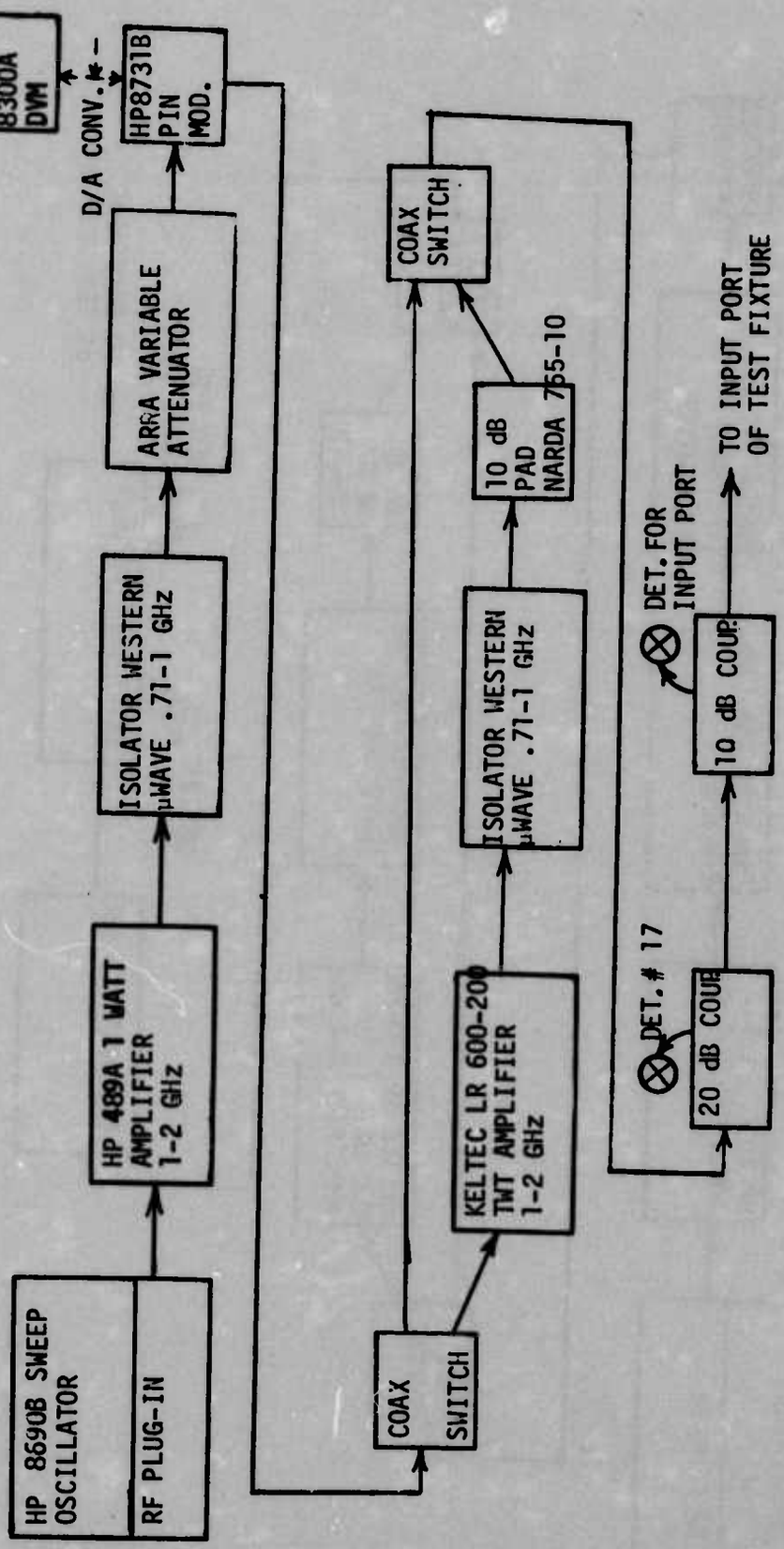


Figure 43 RF Test Setup for 4011 Interference Tests at 0.91 GHz

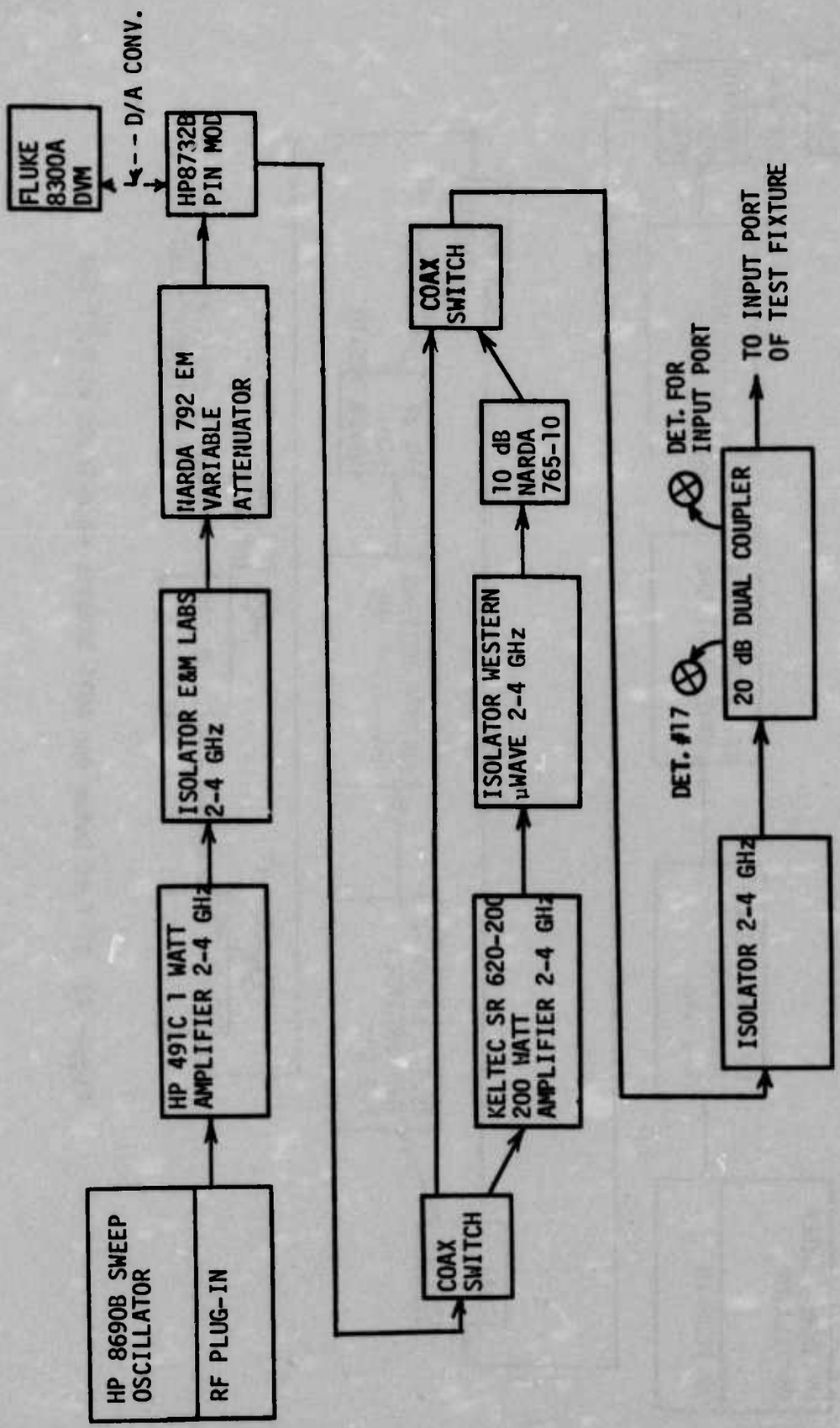


Figure 44 RF Test Setup for 4011 Interference Tests at 3 GHz

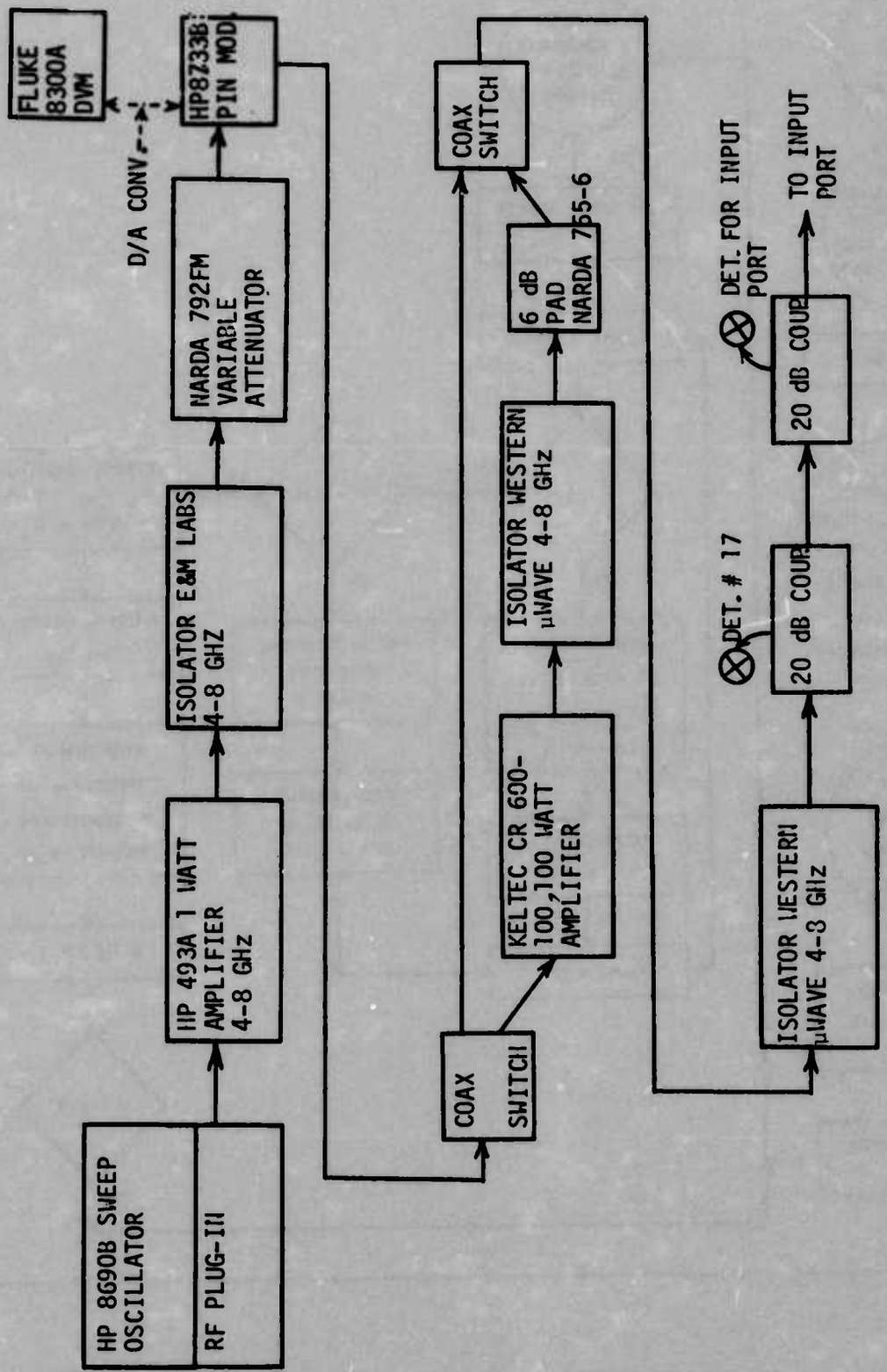


Figure 45 RF Test Setup for 4011 Interference Tests at 5.6 GHz

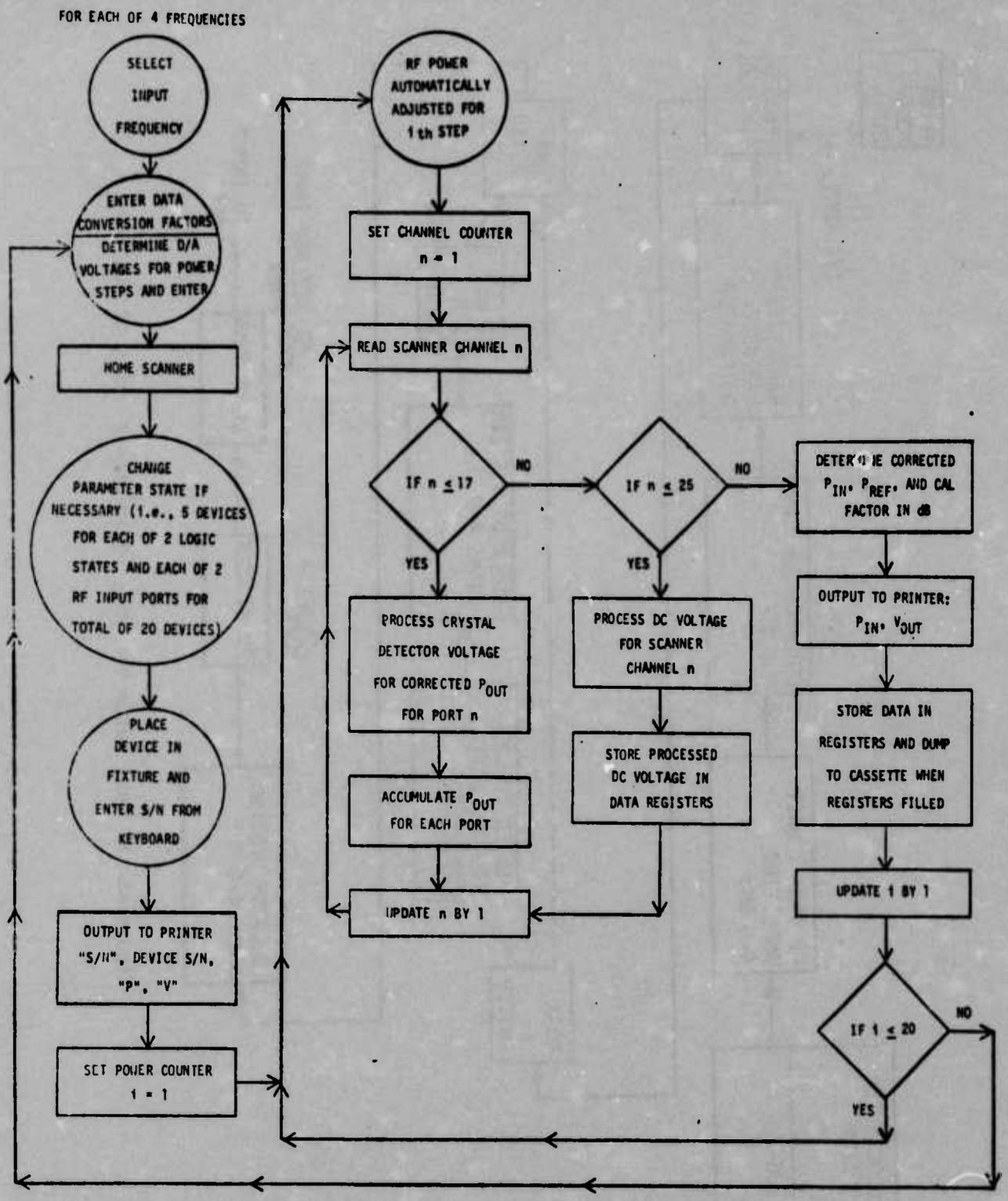


Figure 46 4011 Interference Test Flow Diagram

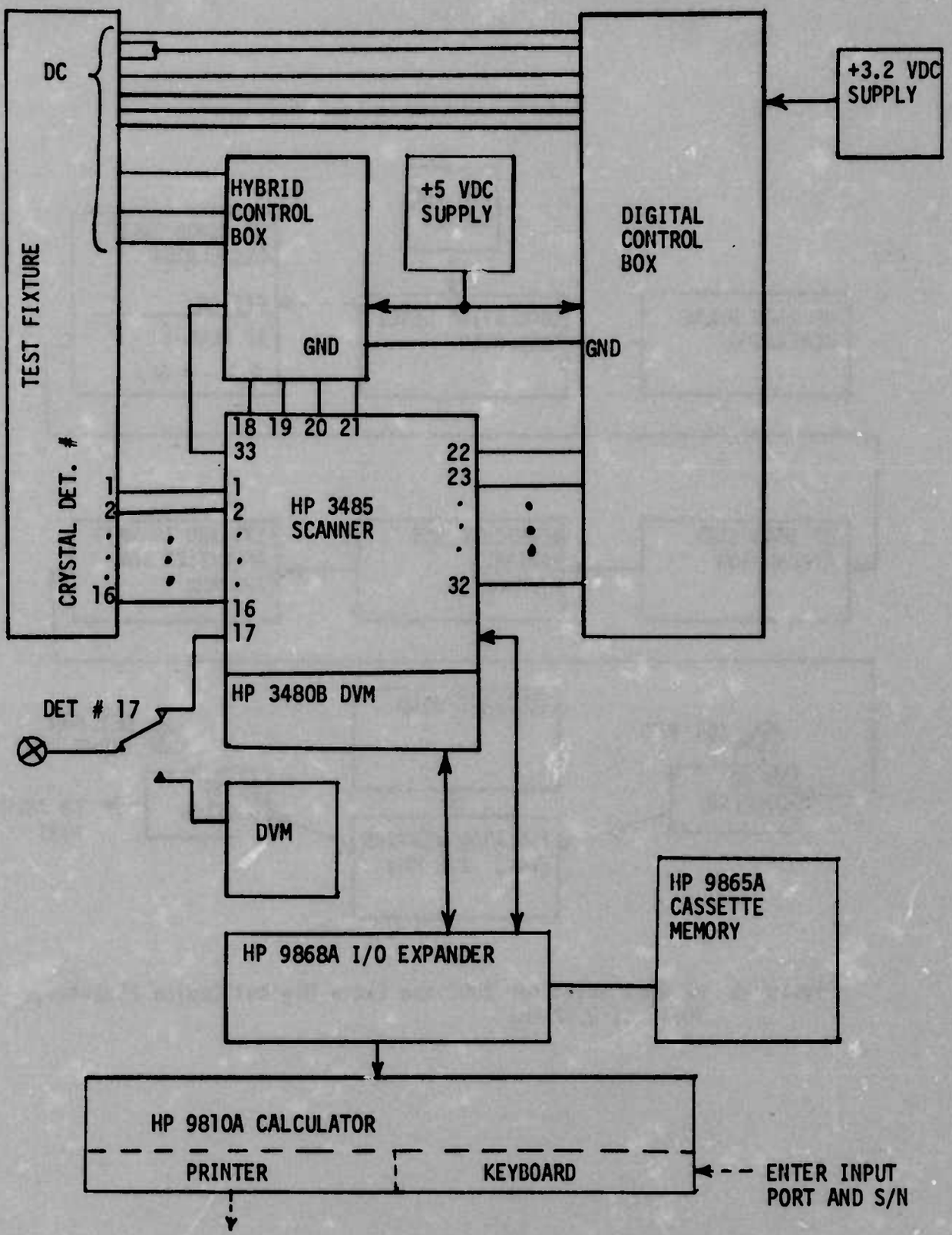


Figure 47 General Test Setup for 2002 Hybrid Interference Test

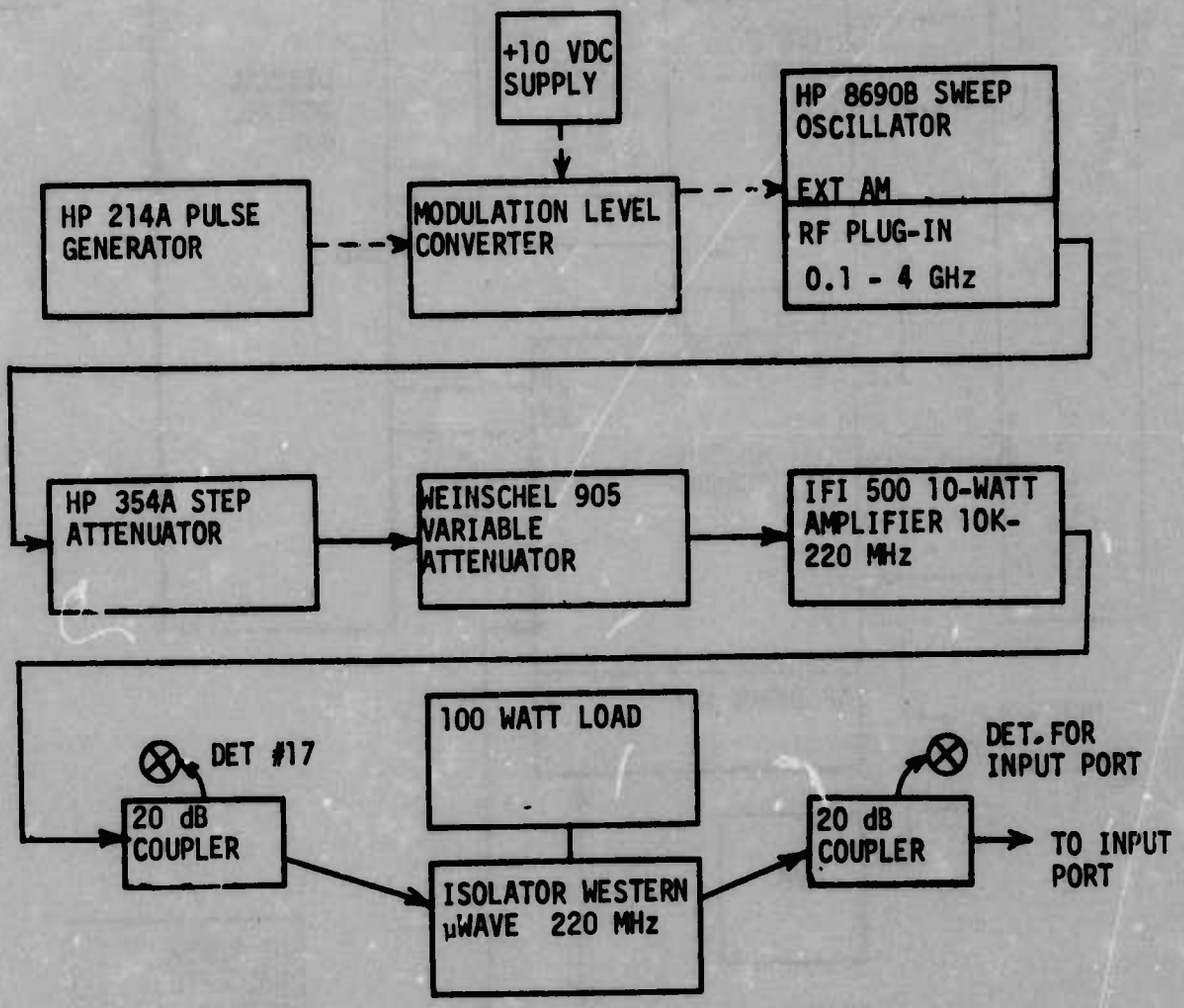


Figure 48 RF Test Setup for 2002 and Extra Digital Device Interference Tests at 0.22 GHz

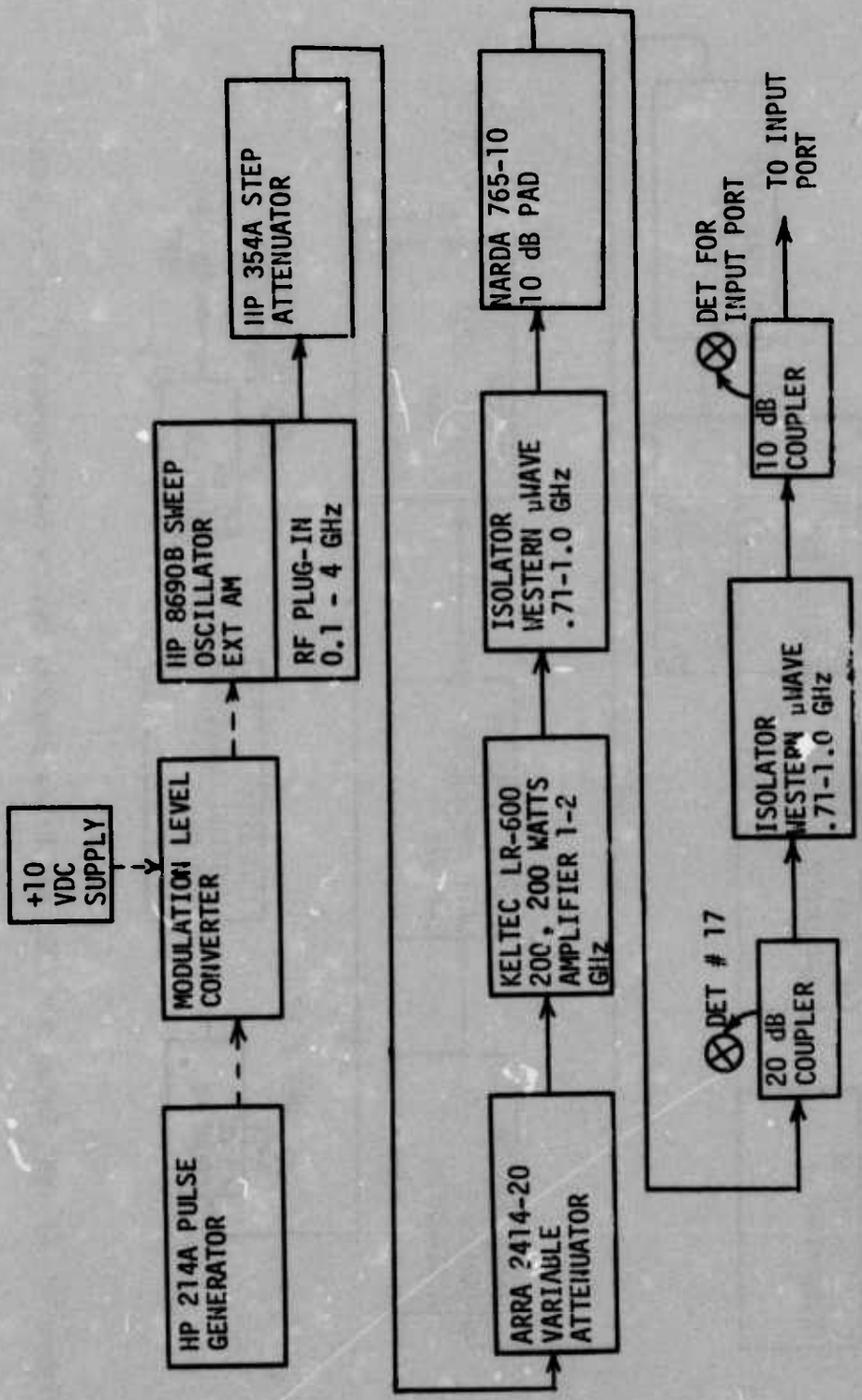


Figure 49 RF Test Setup for 2002 and Extra Digital Device Interference Tests at 0.91 GHz

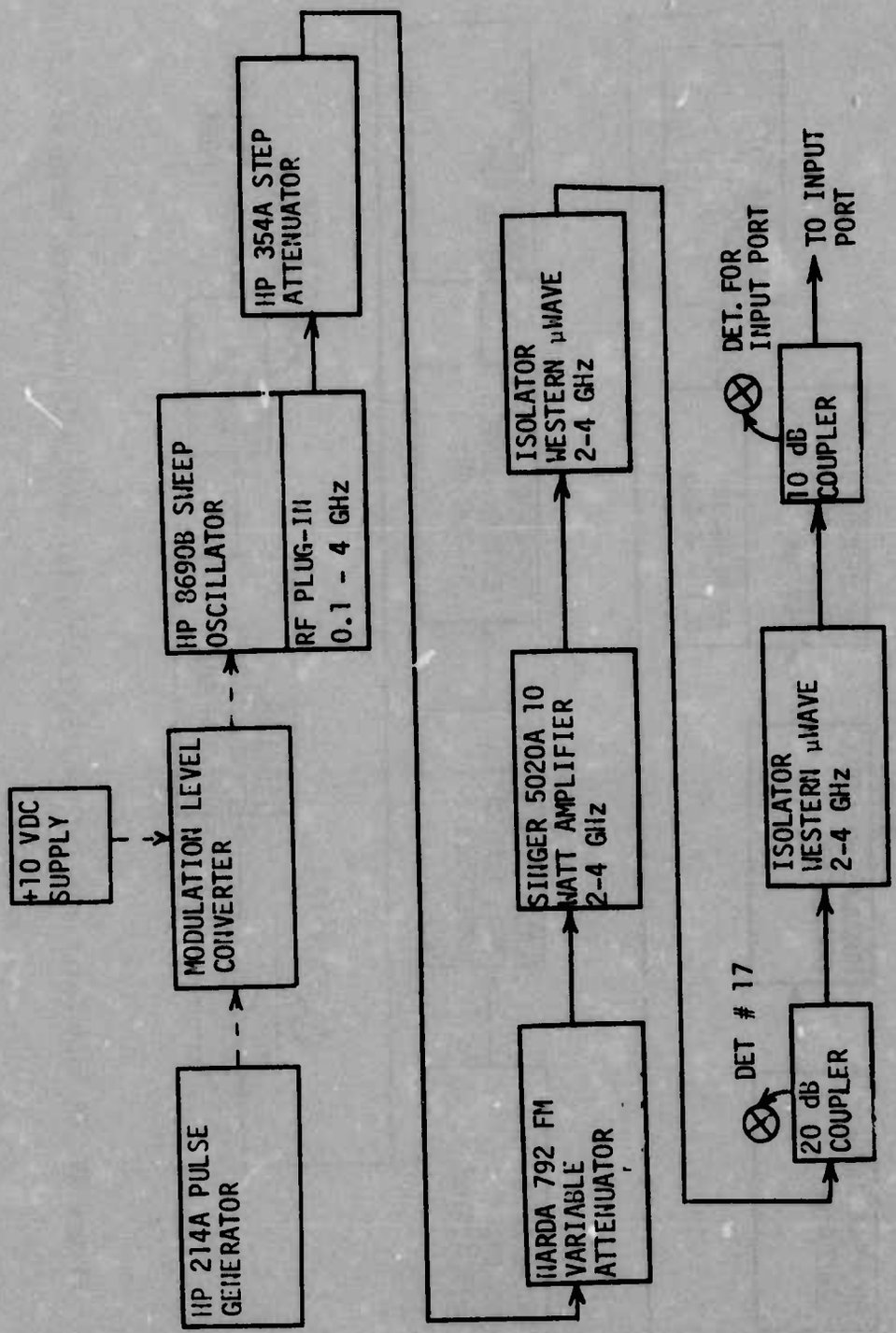


Figure 50 RF Test Setup for 2002 and Extra Digital Device Interference Tests at 3 GHz

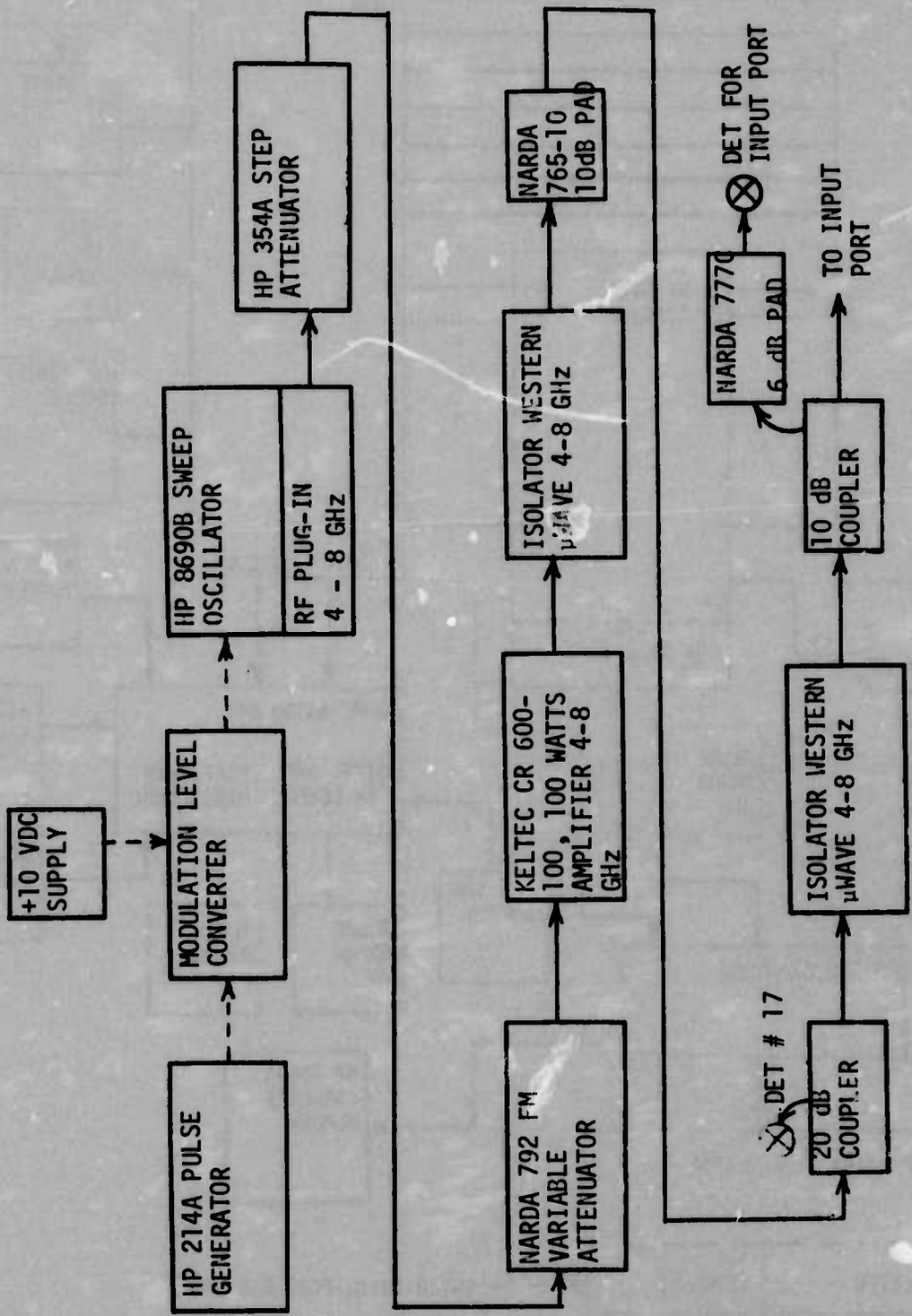


Figure 51 RF Test Setup for 2002 and Extra Digital Device Tests at 5.6 GHz

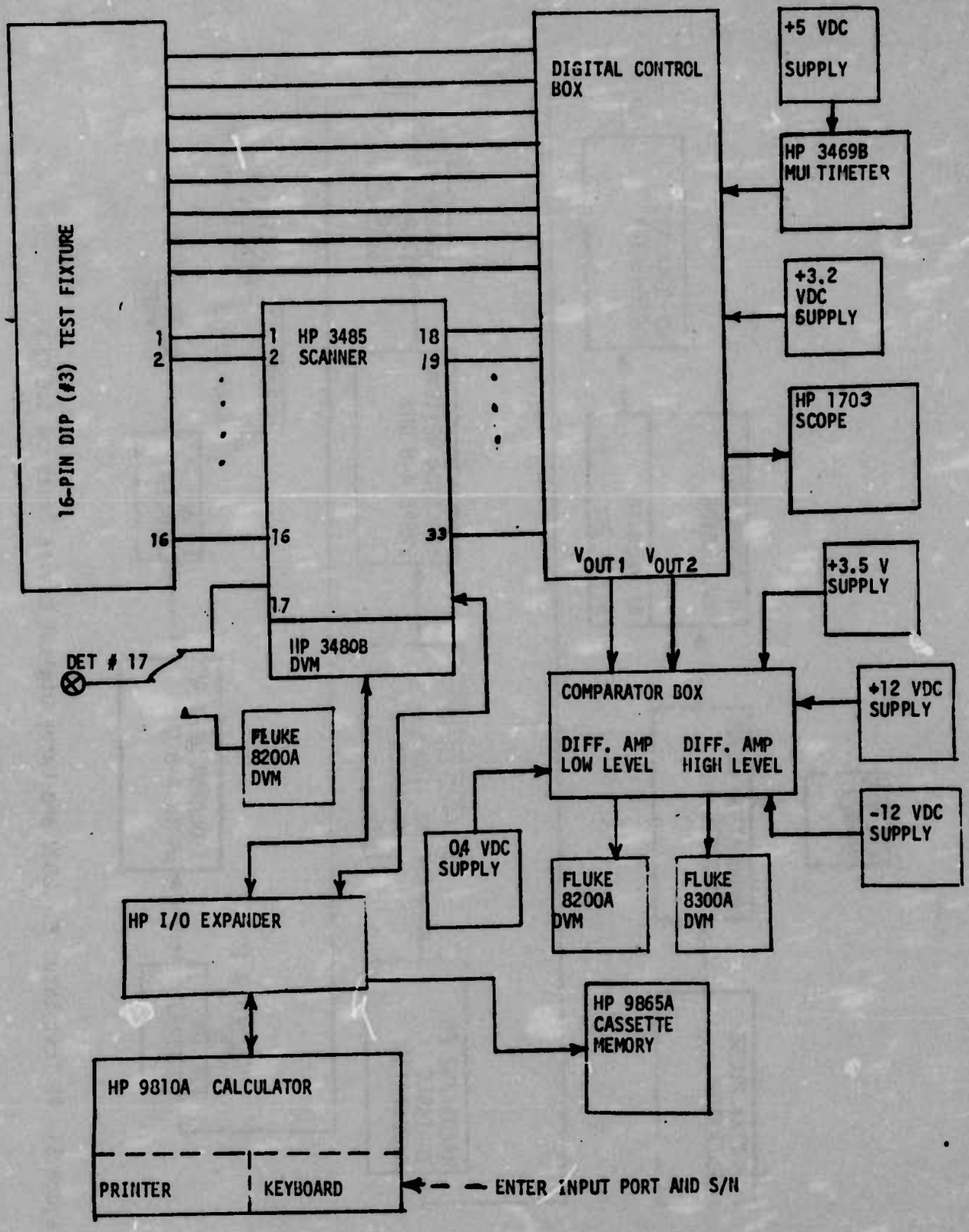


Figure 52 General Test Setup for Extra Digital Device Interference Testing

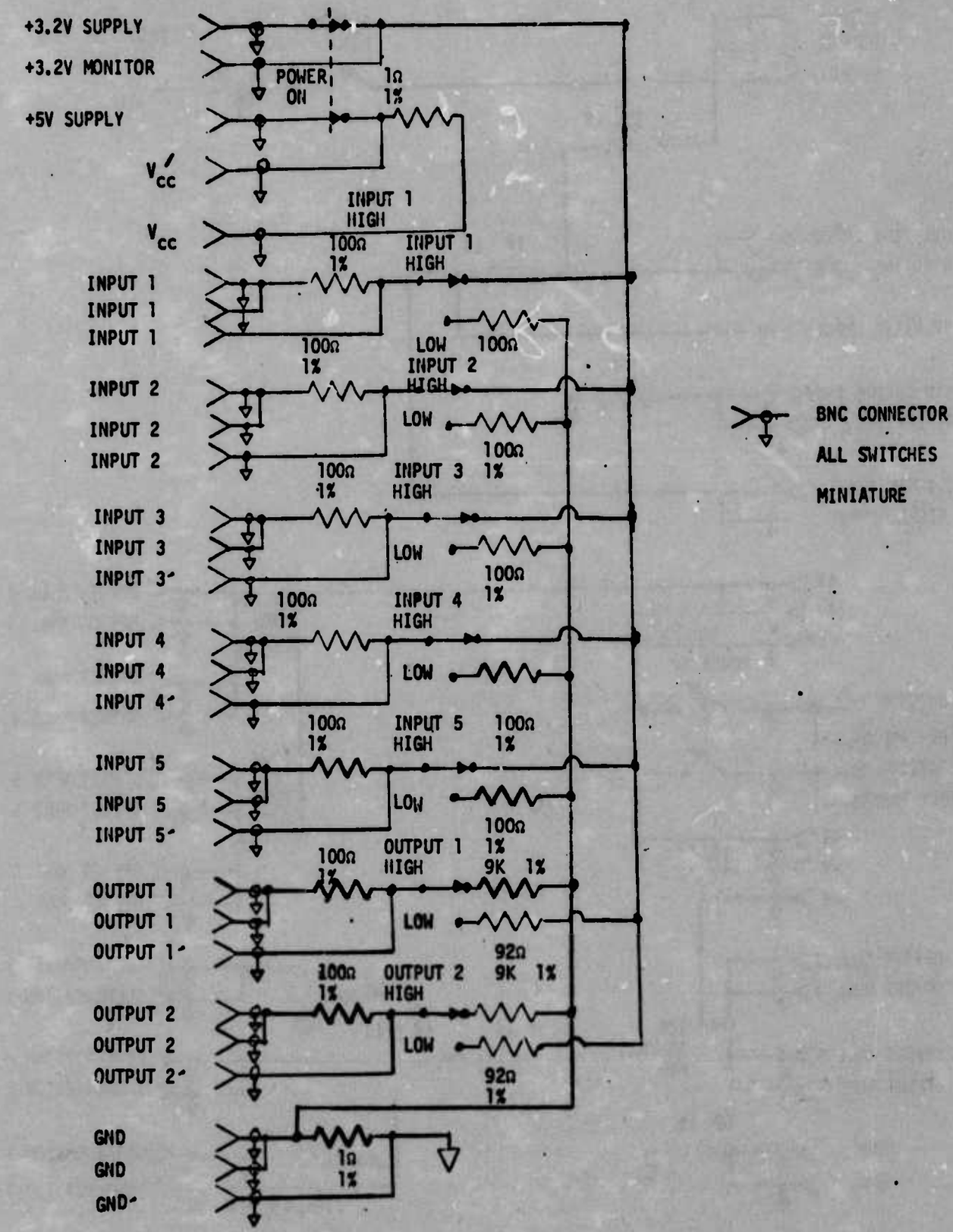


Figure 53 Schematic: Digital Control Box

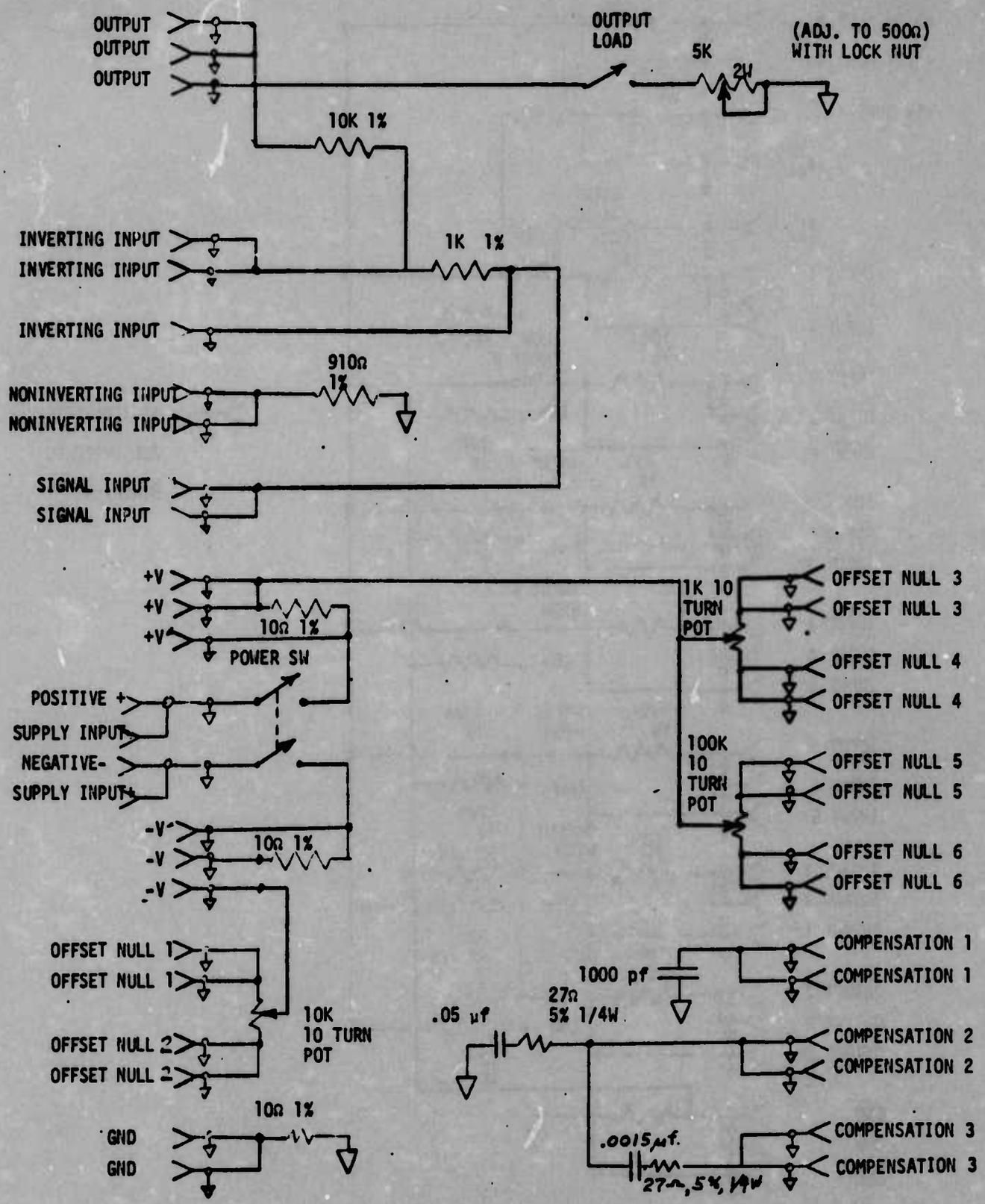


Figure 54 Schematic: Op-Amp Control Box

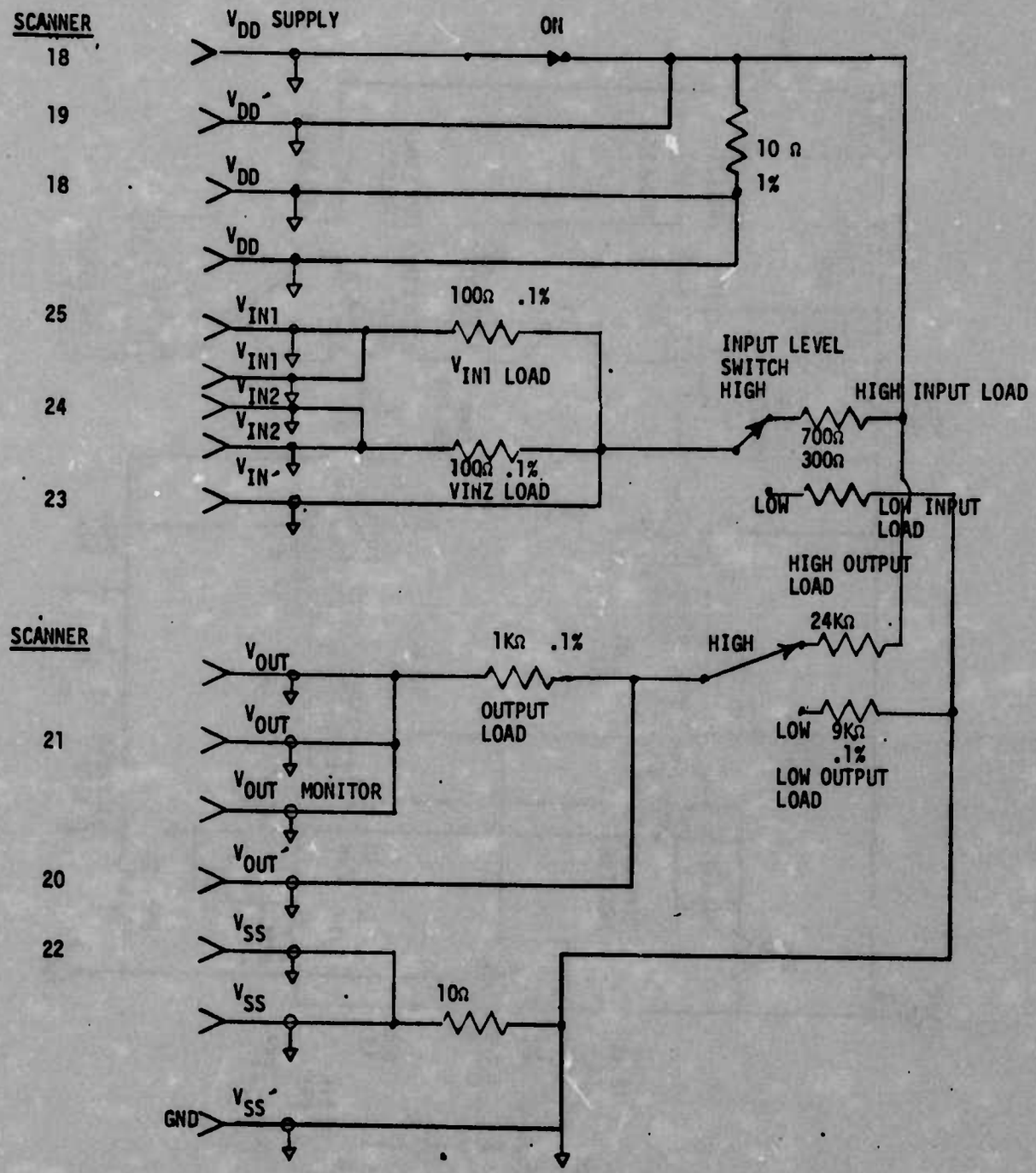


Figure 55 Schematic: MOS Control Box

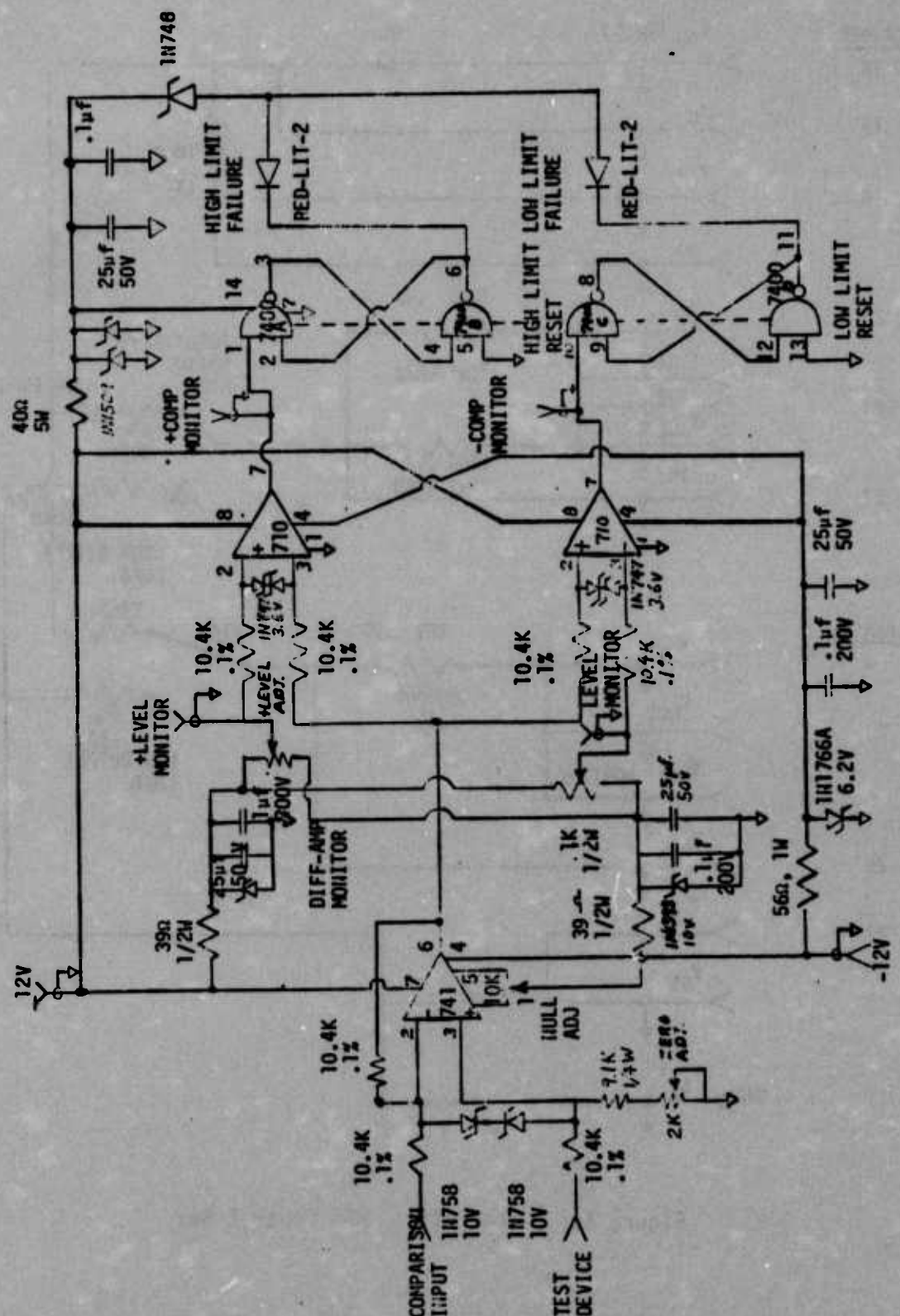


Figure 56 Schematic-Comparator

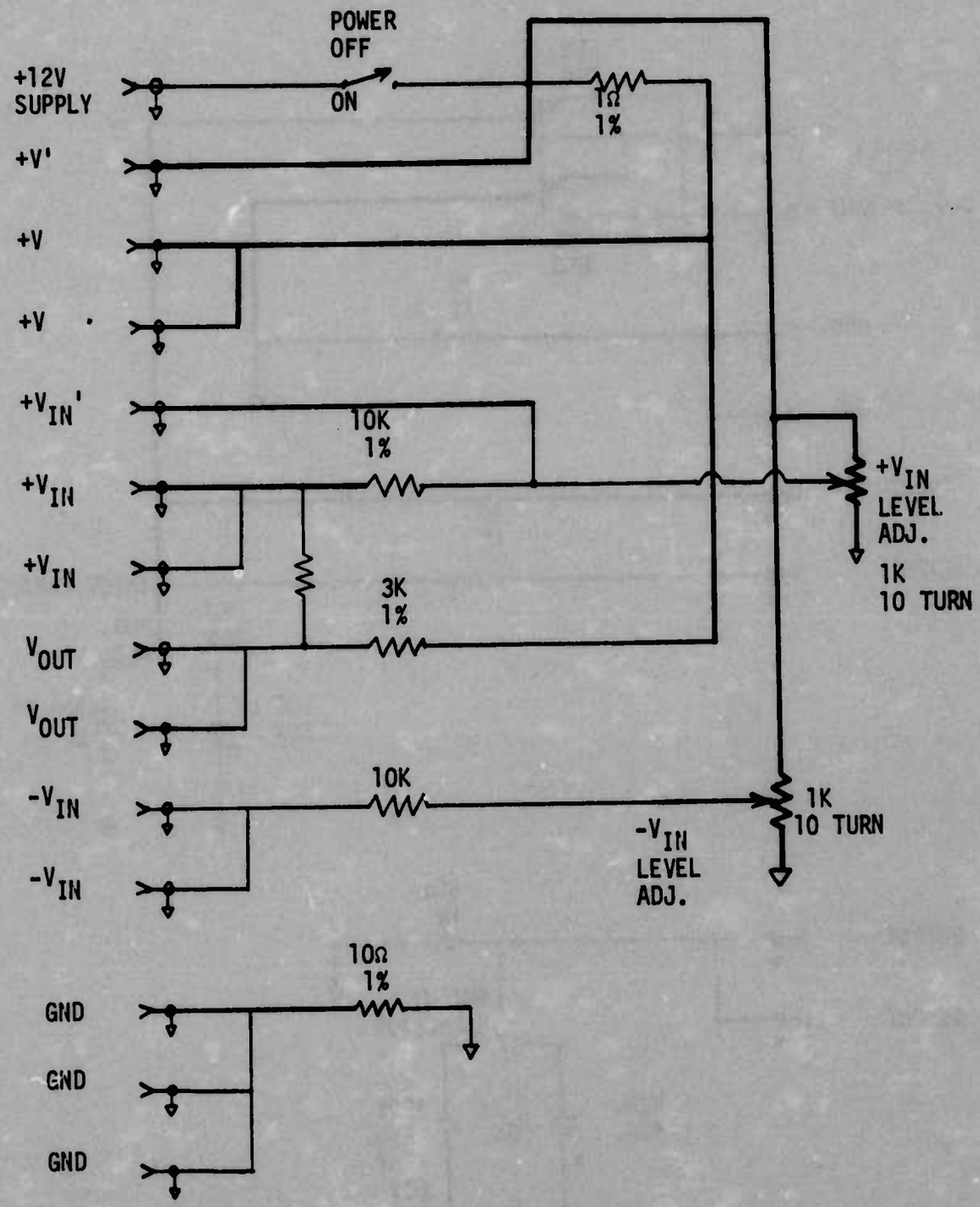


Figure 57 Schematic: Comparator Control Box

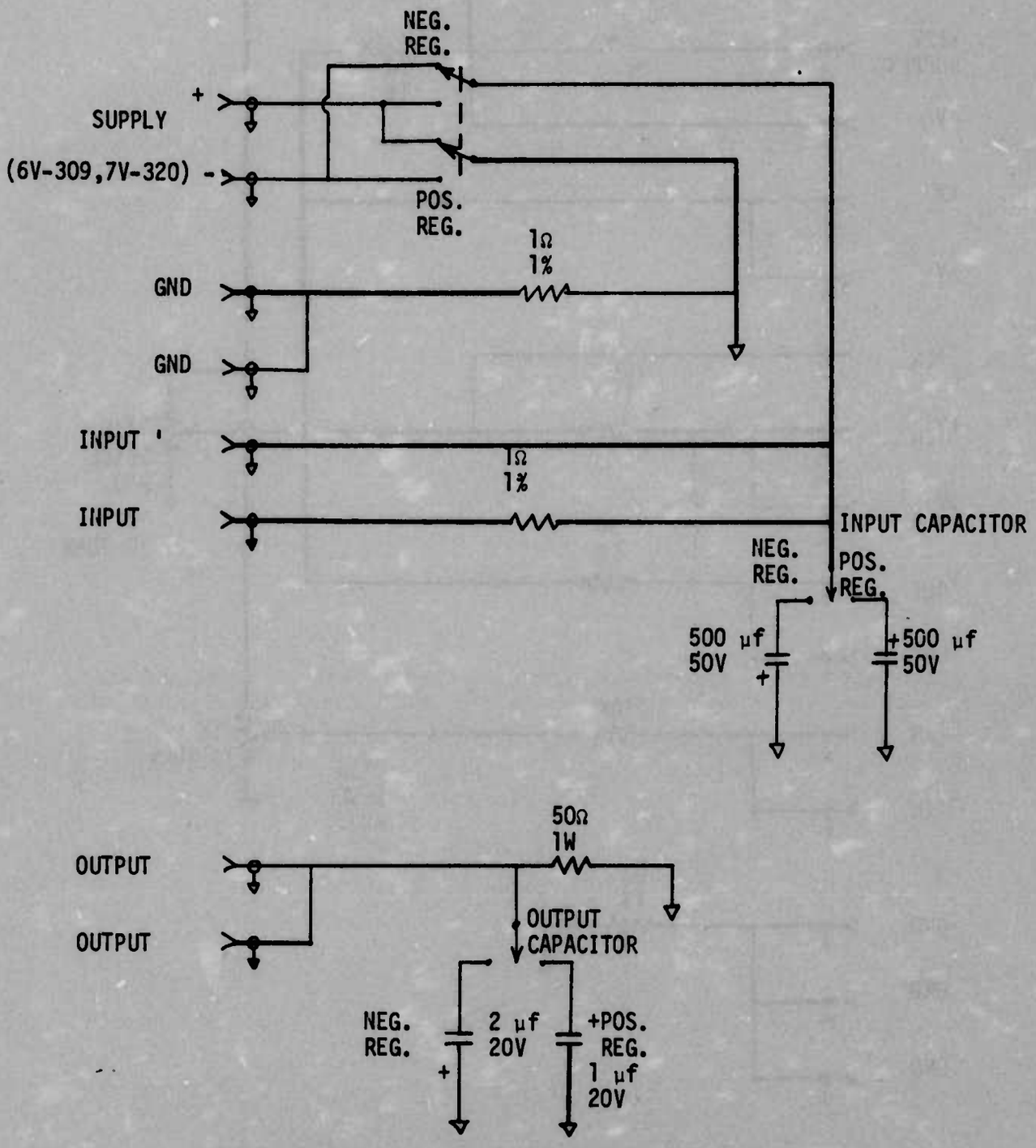


Figure 58 Schematic: Voltage Regulator Control Box

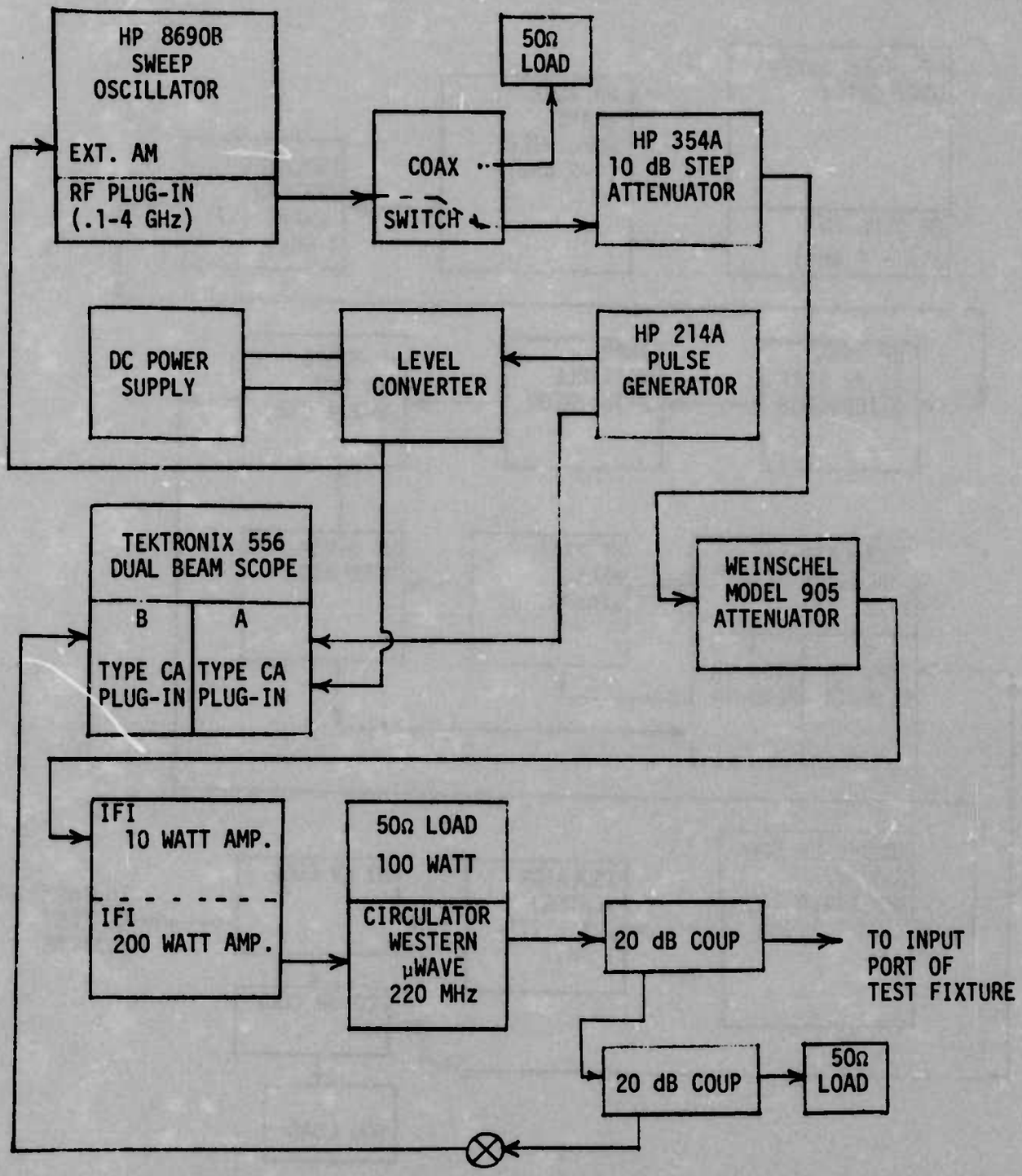


FIGURE 59 TEST SETUP FOR CATASTROPHIC FAILURE TESTING OF 7400 AND 741 AT 0.22 GHz

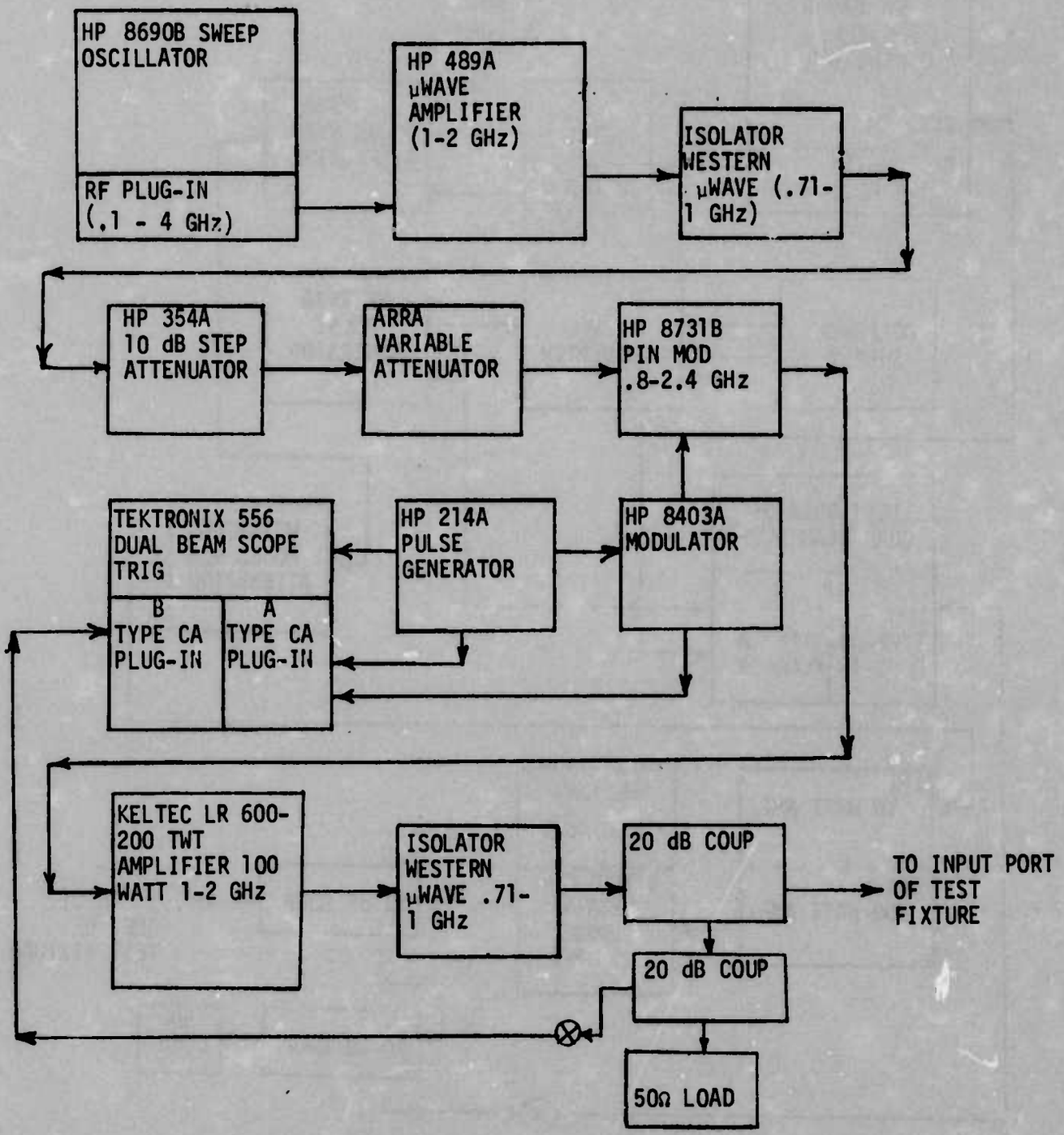


Figure 60 Test Setup for Catastrophic Failure Testing of 7400 and 741 at 0.91 GHz

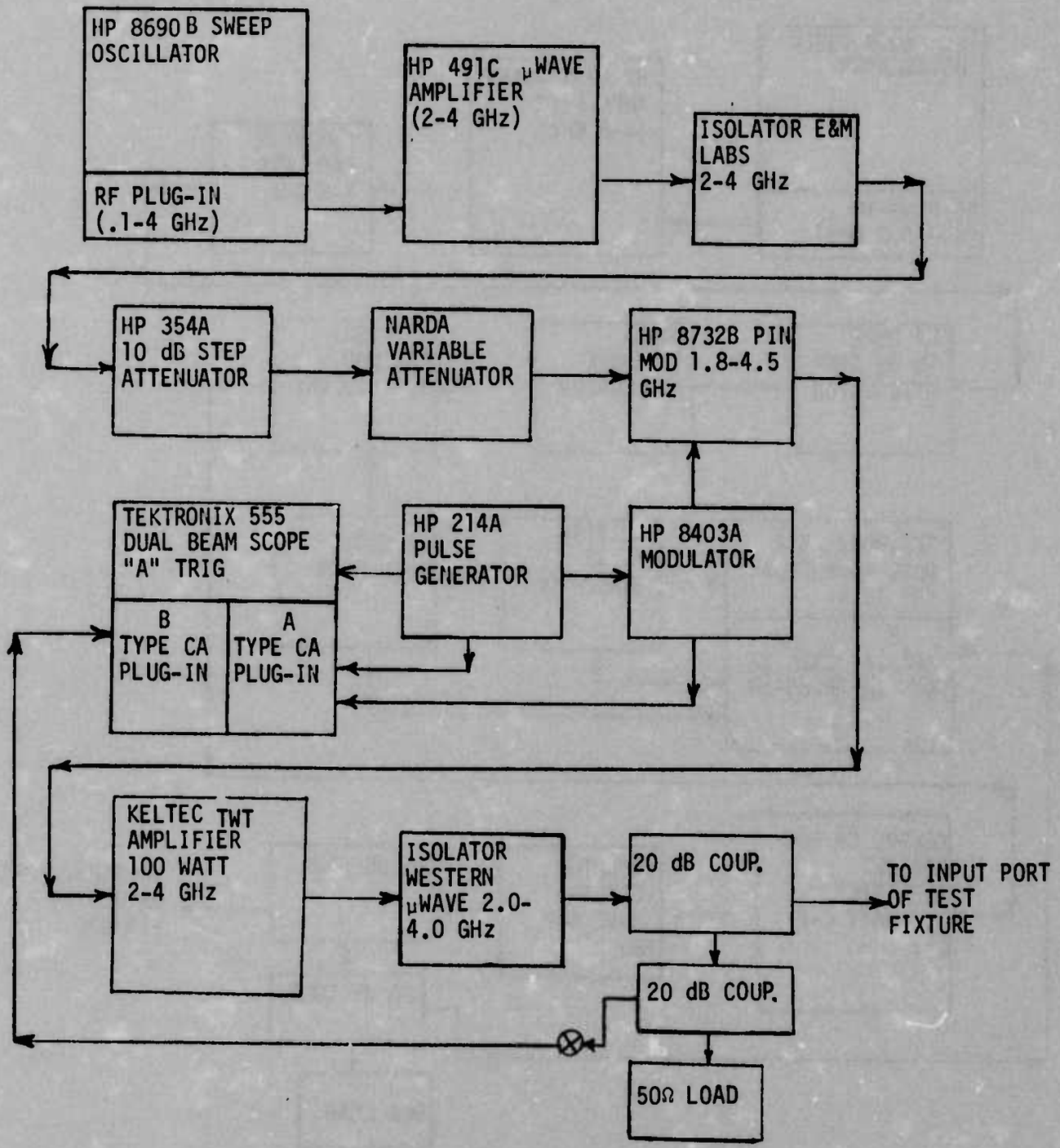


Figure 61 Test Setup for Catastrophic Failure Testing of 7400 and 741 at 3 GHz

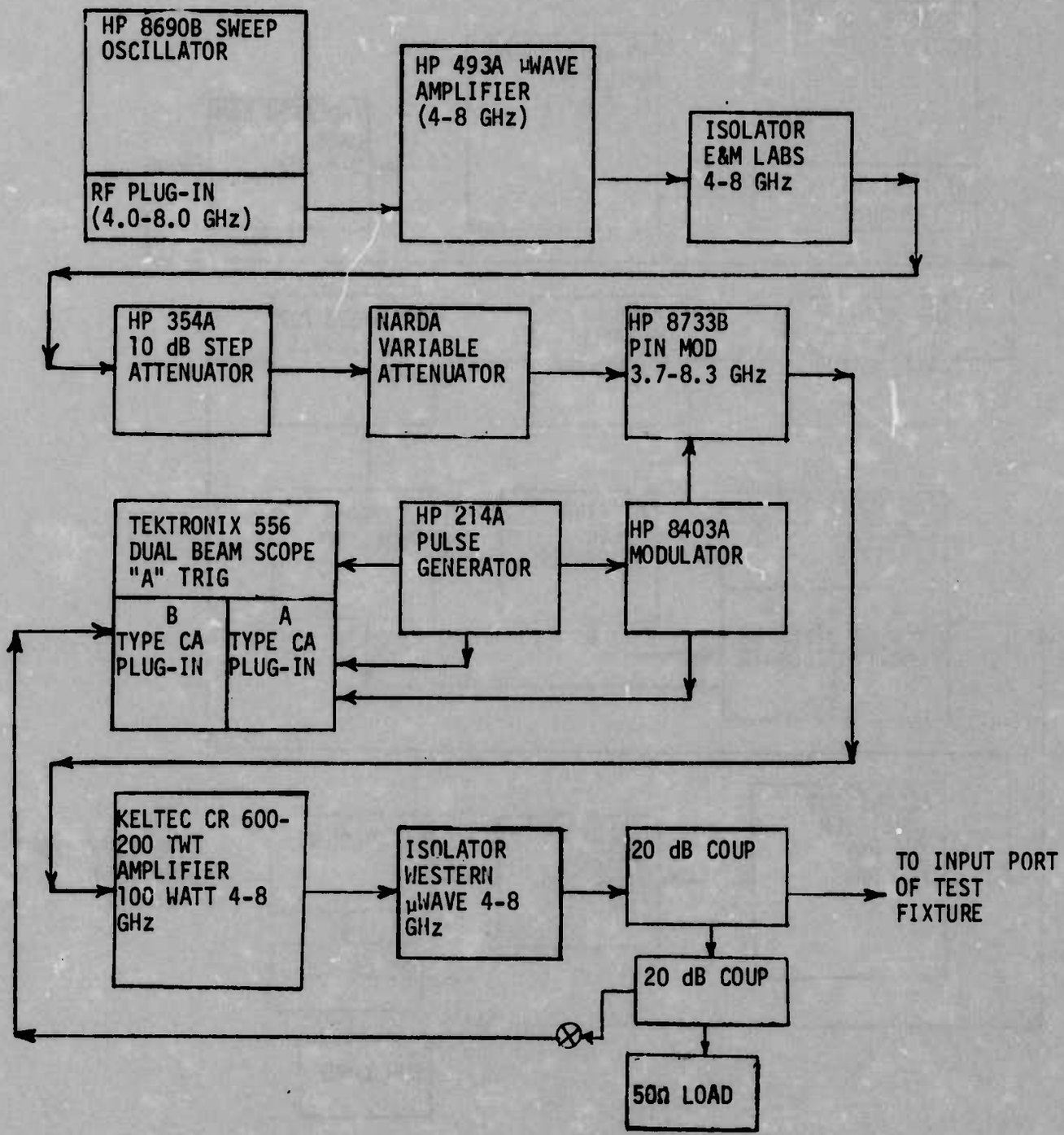


Figure 62 Test Setup for Catastrophic Failure Testing of 7400 and 741 at 5.6 GHz

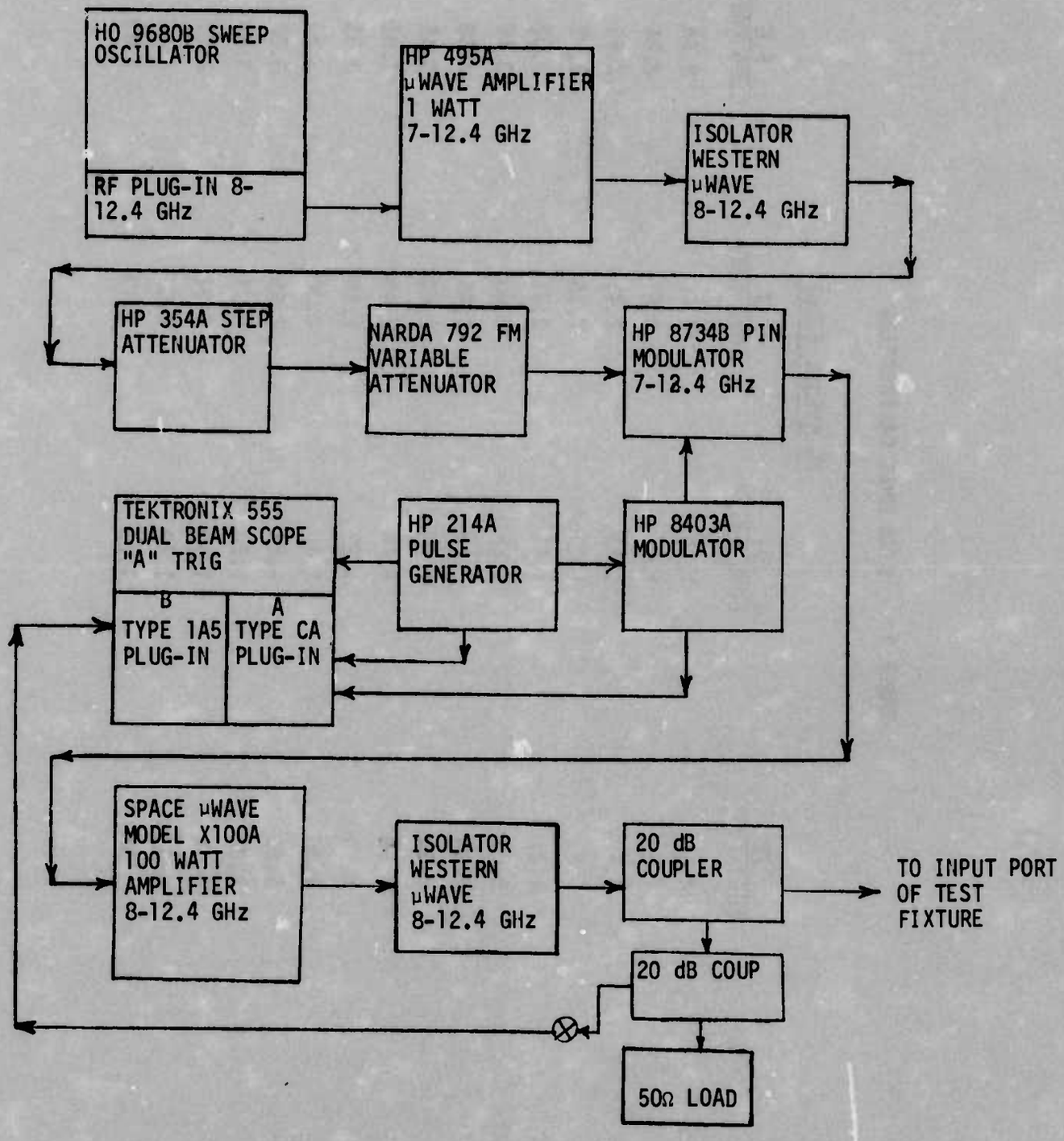


Figure 63 Test Setup for Catastrophic Failure Testing of 7400 9.1 GHz

TABLE 1 BIAS UNIT CALIBRATION

UNIT NO.	FREQUENCY (GHz) .22 LOSS (dB)	.91 LOSS (dB)	3 LOSS (dB)	5.6 LOSS (dB)
1	4.00	1.19	2.48	2.84
2	4.27	1.18	2.51	2.85
3	4.52	1.14	2.45	2.90
4	5.02	1.29	2.55	2.82
5	4.27	1.15	2.71	3.06
6	5.02	1.25	2.53	3.15
7	4.34	1.13	2.44	3.08
8	4.34	1.18	2.63	3.42
9	5.59	1.28	2.49	2.82
10	4.70	1.22	2.55	2.93
11	4.90	1.19	2.30	3.57
12	4.90	1.23	2.65	3.28
13	4.30	1.20	2.71	3.01
14	4.48	1.13	2.34	2.87
15	4.63	1.13	2.57	3.48
17	3.94	1.05	2.13	3.43

TABLE 2 TYPICAL CRYSTAL CALIBRATION DATA

S/N = 2.91000

COEFFICIENTS

B(0)= 1.2707600
B(1)= 1.8522600
B(2)= 0.1669000
B(3)= -0.0268600

VOLTS	MILLIWATTS	Y'	ERROR(%)
0.00184	0.01000	0.01006	-0.63063
0.00410	0.01500	0.01464	2.39674
0.00659	0.02000	0.02011	-0.56073
0.01075	0.03000	0.02993	0.22854
0.01483	0.04000	0.04034	-0.85928
0.01832	0.05000	0.04985	0.30539
0.02198	0.06000	0.06039	-0.65043
0.02530	0.07000	0.07045	-0.64706
0.02840	0.08000	0.08027	-0.33626
0.03432	0.10000	0.10012	-0.11734
0.04746	0.15000	0.14917	0.55004
0.06032	0.20000	0.20361	-1.80563
0.08012	0.30000	0.29934	0.21924
0.09868	0.40000	0.40176	-0.44087
0.11443	0.50000	0.49805	0.38929
0.13050	0.60000	0.60501	-0.83448
0.14400	0.70000	0.70156	-0.22314
0.15710	0.80000	0.80105	-0.13118
0.18170	1.00000	1.00314	-0.31351
0.23200	1.50000	1.47753	1.49824
0.28080	2.00000	2.01529	-0.76460
0.35440	3.00000	2.96917	1.02781
0.42100	4.00000	3.97940	0.51500
0.47730	5.00000	4.94206	1.15874
0.53070	6.00000	5.94709	0.88191
0.57730	7.00000	6.89731	1.46695
0.62370	8.00000	7.91132	1.10851
0.70580	10.00000	9.87174	1.28260
0.88600	15.00000	14.92309	0.51275
1.05200	20.00000	20.49366	-2.46829
1.29600	30.00000	30.29784	-0.99280
1.51000	40.00000	40.50085	-1.25212
1.68900	50.00000	50.20193	-0.40387
1.86300	60.00000	60.66256	-1.10427
2.00900	70.00000	70.23142	-0.33060
2.14900	80.00000	80.09138	-0.11423
2.27600	90.00000	89.61976	0.42249
2.38900	100.00000	98.56803	1.43197

RMS ERROR = 0.98765 PERCENT

Table 3 Crystal Detector Calibration for .22 GHz

CRYSTAL	B(0)	B(1)	B(2)	B(3)
1	1.21158	1.81590	0.291131	0.0350609
2	1.24074	1.79556	0.297538	0.0373098
3	1.23564	1.81008	0.322782	0.0424489
4	1.20574	1.86404	0.314155	0.0384294
5	1.19481	1.85190	0.197600	0.0000358
6	1.24345	1.83651	0.276008	0.0322073
7	1.18596	1.85907	0.241479	0.0201003
8	1.20217	1.83820	0.214148	0.0081422
9	1.24621	1.87547	0.226720	0.0109330
10	1.18101	1.88188	0.290815	0.0348513
11	1.26691	1.86180	0.249975	0.0214213
12	1.24609	1.81700	0.256647	0.0257495
13	1.28168	1.87127	0.311244	0.0386666
14	1.26642	1.79186	0.212334	0.0139630
15	1.25083	1.84017	0.235486	0.0199060
16	1.27627	1.99836	0.345040	0.0421244
17	1.22667	1.79601	0.235048	0.0192368

Table 4 Crystal Detector Calibration Coefficients for .91 GHz

CRYSTAL	B(0)	B(1)	B(2)	B(3)
1	1.26608	1.80527	0.259396	0.0271789
2	1.27636	1.77042	0.239902	0.0204803
3	1.28785	1.76456	0.284451	0.0353526
4	1.25658	1.83276	0.261251	0.0262011
5	1.19111	1.84995	0.195178	0.0018103
6	1.23989	1.82310	0.261538	0.0256129
7	1.18055	1.85284	0.233946	0.0147341
8	1.22359	1.83593	0.194614	0.0014644
9	1.24661	1.86559	0.219143	0.0094050
10	1.17248	1.87113	0.280579	0.0299600
11	1.28972	1.84059	0.234094	0.0162157
12	1.24014	1.82607	0.276245	0.0304371
13	1.27212	1.85121	0.295265	0.0335471
14	1.27301	1.79602	0.249553	0.0256183
15	1.24890	1.83210	0.220251	0.0115535
16	1.26884	1.96376	0.302778	0.0292455
17	1.22657	1.80361	0.254249	0.0250931

Table 5 Crystal Detector Calibration Coefficients for 3 GHz

CRYSTAL	B(0)	B(1)	B(2)	B(3)
1	1.27763	1.81892	0.263690	0.0251775
2	1.28302	1.78576	0.253112	0.0248788
3	1.29163	1.77227	0.280223	0.0334609
4	1.26470	1.84092	0.261317	0.0244254
5	1.19930	1.86181	0.198932	0.0000000
6	1.23358	1.83813	0.272475	0.0270827
7	1.18078	1.86341	0.238082	0.0131825
8	1.21794	1.84851	0.202025	0.0012353
9	1.24672	1.88003	0.233851	0.0126360
10	1.17681	1.88742	0.284124	0.0272287
11	1.26364	1.85084	0.233118	0.0130534
12	1.23927	1.83673	0.272627	0.0261232
13	1.26724	1.88329	0.329327	0.0421188
14	1.27187	1.78476	0.251192	0.0200216
15	1.24135	1.84327	0.223890	0.0098869
16	1.27151	1.98515	0.307480	0.0270774
17	1.21854	1.81764	0.280198	0.0333236

Table 6 Crystal Detector Calibration Coefficients for 5.6 GHz

CRYSTAL	B(0)	B(1)	B(2)	B(3)
1	1.29461	1.79075	0.223596	0.0158620
2	1.28414	1.77989	0.242594	0.0209931
3	1.29507	1.77151	0.274308	0.0317389
4	1.27982	1.84971	0.265698	0.0261293
5	1.22245	1.85525	0.188531	0.0000001
6	1.23468	1.83720	0.262285	0.0241400
7	1.19720	1.86466	0.229990	0.0130577
8	1.22201	1.84760	0.190717	0.0000001
9	1.24856	1.88552	0.227181	0.0100407
10	1.18795	1.88286	0.278124	0.0295213
11	1.27018	1.85684	0.236416	0.0184783
12	1.24434	1.84279	0.273079	0.0290070
13	1.27030	1.89418	0.329192	0.0426467
14	1.26289	1.78335	0.263753	0.0272889
15	1.24186	1.84348	0.214324	0.0087737
16	1.27460	2.00459	0.316760	0.0334410
17	1.20244	1.81554	0.264836	0.0260548

Table 7 Crystal Detector Calibration Coefficients for 9.1 GHz

CRYSTAL	B(0)	B(1)	B(2)	B(3)
1	1.32402	1.82107	0.241207	0.0190506
2	1.30934	1.80303	0.257192	0.0243327
3	1.31229	1.79759	0.285859	0.0328200
4	1.32211	1.84600	0.239467	0.0163895
5	1.28484	1.89469	0.209176	0.0000000
6	1.25896	1.86727	0.278290	0.0262121
7	1.24194	1.88356	0.236714	0.0142114
8	1.23284	1.87247	0.202222	0.0000000
9	1.26049	1.90474	0.230906	0.0061021
10	1.22897	1.90423	0.271844	0.0235726
11	1.30727	1.86117	0.210239	0.0034527
12	1.27749	1.83829	0.236720	0.0124962
13	1.28878	1.90109	0.308784	0.0341583
14	1.25911	1.79075	0.287093	0.0347386
15	1.24244	1.84655	0.200972	0.0041398
16	1.30114	2.05071	0.353879	0.0426360
17	1.22237	1.82678	0.288599	0.0331120

Table 8 HP 9810A Program for Crystal Detector Calibration

```
0001--   ,   --55
0002--CLX---37
0003--LBL---51
0004--  A  ---62
0005--FMT---42
0006--FMT---42
0007--  D  ---63
0008--  E  ---60
0009--XTO---23
0010--  .  ---21
0011--CNT---47
0012--STO---44
0013--FMT---42
0014--STP---41
0015--XTO---23
0016--  0  ---00
0017--PRT---45
0018--  1  ---01
0019--XTO---23
0020--  a  ---13
0021--XTO---23
0022--  b  ---14
0023--LBL---51
0024--  B  ---66
0025--FMT---42
0026--  4  ---04
0027--  1  ---01
0028--FMT---42
0029--SFL---54
0030--FMT---42
0031--CNT---47
0032--  5  ---05
0033--  0  ---00
0034--  UP---27
0035--  a  ---13
0036--  +  ---33
0037--YTO---40
0038--  5  ---05
0039--  0  ---00
0040--XFR---67
0041--IND---31
0042--  5  ---05
0043--  0  ---00
0044--FMT---42
0045--  4  ---04
0046--  2  ---02
0047--XTO---23
0048--CNT---47
0049--FMT---42
0050--FMT---42
0051--STO---40
0052--IND---31
0053--  I  ---65
0054--XTO---23
0055--  C  ---61
0056--  H  ---74
0057--  -  ---34
0058--  M  ---70
0059--  E  ---60
0060--XTO---23
0061--  E  ---60
0062--  a  ---13
0063--FMT---42
0064--  1  ---01
0065--  0  ---00
0066--  UP---27
0067--  b  ---14
0068--X>Y---53
0069--GTO---44
0070--S/R---77
0071--LBL---51
0072--  F  ---16
0073--STP---41
0074--FMT---42
0075--  4  ---04
0076--  1  ---01
0077--FMT---42
0078--  1  ---01
0079--FMT---42
0080--PSE---57
0081--PSE---57
0082--FMT---42
0083--  3  ---03
0084--  3  ---03
0085--  .  ---21
0086--  UP---27
0087--CNT---47
0088--CNT---47
0089--FMT---42
0090--  4  ---04
0091--  1  ---01
0092--FMT---42
0093--  1  ---01
0094--FMT---42
0095--  UP---27
0096--  2  ---02
0097--  1  ---01
0098--  UP---27
0099--  a  ---13
0100--X<Y---52
0101--STO---40
0102--LBL---51
0103--  E  ---60
0104--CNT---47
0105--XEY---30
0106--  3  ---03
0107--  1  ---01
0108--RLN---36
0109--X<Y---52
0110--GTO---44
0111--LBL---51
0112--  C  ---61
0113--CNT---47
0114--  DN---25
0115--  1  ---01
0116--  0  ---00
0117--  0  ---00
0118--  X  ---36
0119--GTO---44
0120--LBL---51
0121--  D  ---63
0122--LBL---51
0123--  C  ---61
0124--  DN---25
0125--  1  ---01
0126--  0  ---00
0127--  X  ---36
0128--GTO---44
0129--LBL---51
0130--  D  ---63
0131--LBL---51
0132--  E  ---60
0133--XEY---30
0134--  1  ---01
0135--  0  ---00
0136--XEY---30
0137--X>Y---53
0138--  DN---25
0139--GTO---44
0140--LBL---51
0141--  D  ---63
0142--  DN---25
0143--  .  ---21
0144--  1  ---01
0145--  X  ---36
0146--LBL---51
0147--  D  ---63
0148--  G  ---15
0149--PRX---26
0150--  3  ---03
```

Table 8 HP 9810A Program for Crystal Detector Calibration (Cont)

```
0151--          -36
0152-- DN ---25
0153--INT---64
0154--XTO---23
0155--IND---31
0156-- α ---13
0157--CNT---47
0158--CNT---47
0159--FMT---42
0160--FMT---42
0161--YTO---40
0162--IND---31
0163-- I ---65
0164--XTO---23
0165-- C ---61
0166-- H ---74
0167-- - ---34
0168-- D ---63
0169-- E ---60
0170--XTO---23
0171-- . ---21
0172--FMT---42
0173--STP---41
0174--FMT---42
0175-- 3 ---03
0176-- 3 ---03
0177-- . ---21
0178-- UP---27
0179-- G ---15
0180-- 1 ---01
0181-- 0 ---00
0182--DIV---35
0183--YTO---40
0184--IND---31
0185-- + ---33
0186-- α ---13
0187--XFR---67
0188--IND---31
0189-- α ---13
0190-- UP---27
0191--INT---64
0192-- - ---34
0193-- UP---27
0194--EEX---26
0195-- 3 ---03
0196--DIV---35
0197--RUP---22
0198--XCY---30
0199-- 1 ---01
0200-- 0 ---00
```

```
0201          --36
0202-- DI ---25
0203--XEY---30
0204--FMT---42
0205--FMT---42
0206-- π ---56
0207--X<Y---52
0208-- M ---70
0209--IND---31
0210--PSE---57
0211--CLR---20
0212--INT---64
0213--X<Y---52
0214--INT---64
0215-- O ---71
0216-- L ---72
0217--XTO---23
0218--YTO---40
0219--PSE---57
0220--FMT---42
0221--PNT---45
0222--XEY---30
0223--PNT---45
0224-- 1 ---01
0225-- UP---27
0226-- E ---60
0227-- 4 ---04
0228-- 1 ---01
0229-- UP---27
0230-- α ---13
0231--X<Y---52
0232--GTO---44
0233--LBL---51
0234-- B ---66
0235--CNT---47
0236--FMT---42
0237-- 5 ---05
0238--EEX---26
0239--FMT---42
0240--FMT---42
0241-- α ---13
0242-- E ---60
0243-- C ---61
0244-- O ---71
0245-- α ---13
0246-- D ---63
0247--IFG---43
0248--FMT---42
0249--STP---41
0250-  R  -10
```

```
0          ---04
0253-- UP---27
0253-- 0 ---00
0254--FMT---42
0255-- 5 ---05
0256--XTO---23
0257--GTO---44
0258--LBL---51
0259-- A ---64
0260--LBL---51
0261-- F ---16
0262--FMT---42
0263--FMT---42
0264-- C ---61
0265-- H ---74
0266-- A ---64
0267-- N ---73
0268-- L ---12
0269-- E ---60
0270--CNT---47
0271-- α ---13
0272-- A ---64
0273-- N ---73
0274-- G ---15
0275-- E ---60
0276--FMT---42
0277-- 1 ---01
0278--XTO---23
0279-- L ---12
0280--S/R---70
0281--END---40
```

Table 9 HP 9830A Program to Convert Data to Matrix Format for 1 Crystal

```
10 DISP "FIRST FILE #";
20 REM  PROGRAM TO CONVERT FROM DATA TO MATRIX FORMAT FOR 1 CRYSTAL
30 INPUT N
40 DISP "FIRST MATRIX FILE#";
50 INPUT M
60 DIM A[84,1],CS[8,41]
70 REDIM A[84,1]
80 LOAD  DATA N,A
90 C[1,1]=C[2,1]=A[1,1]
100 GOTO 180
110 C[5,1]=C[6,1]=A[43,1]
120 C[7,1]=C[8,1]=A[64,1]
130 GOTO 160
140 IF A[22,1]#C[1,1] THEN 560
150 IF A[1,1]#C[3,1] THEN 560
160 IF I=1 THEN 260
170 FOR J=0 TO 1
180 FOR K=2 TO 41
190 V=A[K,1]
200 P=INT(V)/1000
210 V=10*(V-INT(V))
220 C[1,K]=P
230 C[2,K]=V
240 NEXT K
250 GOTO 400
260 FOR J=0 TO 1
270 FOR K=2 TO 21
280 V=A[J*21+K,1]
290 P=INT(V)/1000
300 V=10*(V-INT(V))
310 IF J>0 THEN 350
320 C[2*J+3,K]=P
330 C[2*J+4,K]=V
340 GOTO 370
350 C[2*J-1,K+20]=P
360 C[2*J,K+20]=V
370 NEXT K
380 NEXT J
390 NEXT I
400 FOR I=1 TO 41
410 WRITE (15,430)C[1,I],C[2,I]
420 NEXT I
430 FORMAT 4F10.5
440 REDIM A[2,42]
460 FOR K=1 TO 41
470 A[1,K]=C[1,K]
```

Table 9 HP 9830A Program to Convert Data to Matrix Format for 1 Crystal (cont)

```
480 A[2,K]=C[2,K]
490 NEXT K
500 A[1,42]=A[2,42]=A[1,1]
510 STORE  DATA #5,M,A
520 N=N+1
530 M=M+1
550 GOTO 70
560 DISP "S/N NOT =";
570 END
```

Table 10 HP 9830A Program to Calculate Coefficients for Crystal Detectors - Degree = 3

```
10 DIM CS[36],B[8],A[2,42]
20 REM  PROGRAM TO CALCULATE CRYSTAL DETECTOR COEFFICIENTS
30 DISP "FIRST FILE #, # OF FILES";
40 INPUT N1,N2
50 FOR L=0 TO N2-1
60 MAT C=ZER
70 MAT B=ZER
80 B[1]=1
90 W=N=S1=S2=S3=S4=S5=0
100 D1=D2=3
110 LOAD  DATA N1+L,A
120 FIXED 6
130 FOR H=2 TO 42
140 B[2]=LGT(A[2,H])
150 Y=LGT(A[1,H])
160 FOR I=2 TO D2
170 B[I+1]=B[I]*B[2]
180 NEXT I
190 B[D2+2]=Y
200 R=0
210 FOR I=1 TO D2+2
220 FOR J=I TO D2+2
230 R=R+1
240 C[R]=C[R]+B[I]*B[J]
250 NEXT J
260 NEXT I
270 S1=S1+B[2]
280 S2=S2+B[2]^2
290 S3=S3+Y
300 S4=S4+Y^2
310 S5=S5+B[2]*Y
320 N=N+1
330 NEXT H
340 D1=3
350 IF W=0 THEN 830
360 T=0
370 FOR I=1 TO D1+1
380 B[I]=0
390 FOR J=1 TO D1-I+2
400 R=(I+J-1)*(D2+2-0.5*(I+J))
410 B[I]=B[I]+C[T+J]*C[R]
420 NEXT J
430 T=I*(D2+(3-I)/2)
440 NEXT I
450 R1=0
460 FOR I=2 TO D1+1
470 R1=R1+C[I*(D2+(3-I)/2)]^2
```

Table 10 HP 9830A Program to Calculate Coefficients for Crystal Detector - Degree = 3 (cont)

```
480 NEXT I
490 TO=C[(D2+1)*(D2+2)/2]
500 TO=TO-C[D2+1]^2
510 FOR I=1 TO 3
520 PRINT
530 NEXT I
540 PRINT " ","S/N ="A[1,1];"SECOND CALIBRATION"
550 PRINT
560 PRINT
570 PRINT " ","COEFFICIENTS"
580 PRINT
590 FORMAT 12X,F2.0,F12.7
600 FOR I=1 TO D1+1
610 WRITE (15,590)"B("I-1")="B[I]
620 NEXT I
630 PRINT
640 PRINT
650 PRINT " ","R SQUARE ="R1/TO
660 PRINT
670 PRINT " ","   VOLTS","MILLIWATTS","   Y'  ","  ERROR(%)"
680 Q=0
690 FOR I=2 TO 41
700 X1=A[2,I]
710 Y1=A[1,I]
720 Y2=10^(B[1]+B[2]*LGT(X1)+B[3]*(LGT(X1))^2+B[4]*(LGT(X1))^3)
730 Q=Q+((Y1-Y2)/Y1)^2
740 PRINT " ",X1,Y1,Y2,100*(Y1-Y2)/Y1
750 NEXT I
760 PRINT
770 PRINT
780 PRINT " ","RMS ERROR ="100*SQR(Q/40)"PERCENT"
790 FOR J=1 TO 6
800 PRINT
810 NEXT J
820 GOTO 1210
830 P=W=1
840 D2=D2+1
850 FOR J=1 TO D2
860 C[P]=SQRC[P]
870 FOR I=1 TO D2-J+1
880 C[P+I]=C[P+I]/C[P]
890 NEXT I
900 R=P+I
910 S=R
920 FOR I=1 TO D2-J
930 P=P+1
940 FOR M=1 TO D2+2-J-I
```

Table 10 HP 9830A Program to Calculate Coefficients for Crystal Detectors - Degree = 3 (cont)

```
950 C[R+M-1]=C[R+M-1]-C[P]*C[P+M-1]
960 NEXT M
970 R=R+M-1
980 NEXT I
990 P=S
1000 NEXT J
1010 T=(D2+1)*(D2+2)/2
1020 FOR I=1 TO D2-1
1030 T=T-1-I
1040 C[T]=1/C[T]
1050 FOR J=1 TO D2-I
1060 P=D2+1-I-J
1070 P=P*(D2+1-(P-1)/2)-I
1080 R=P-J
1090 S=0
1100 U=I+J+1
1110 V=P
1120 FOR K=1 TO J
1130 V=V+U-K
1140 S=S-C[R+K]*C[V]
1150 NEXT K
1160 C[P]=S/C[R]
1170 NEXT J
1180 NEXT I
1190 C[1]=1/C[1]
1200 GOTO 360
1210 NEXT L
1220 END
```

Table 11 General Fixture Calibration Program (HP 9810A)- 16 Pins

```
0000 -CLR---20
0001-- R ---55
0002--CLX---37
0003--FMT---42
0004--FMT---42
0005-- E ---60
0006-- N ---73
0007--XTO---23
0008-- E ---60
0009-- a ---13
0010--CNT---47
0011-- D ---63
0012-- A ---62
0013--XTO---23
0014-- A ---62
0015--CNT---47
0016-- C ---61
0017-- A ---62
0018-- a ---13
0019-- D ---63
0020--FMT---42
0021--CNT---47
0022--FMT---42
0023--XFR---67
0024--FMT---42
0025--FMT---42
0026-- F ---16
0027-- a ---13
0028-- E ---60
0029-- b ---14
0030-- . ---21
0031--CNT---47
0032--SFL---54
0033--FMT---42
0034--XFR---67
0035-- 0 ---00
0036--PNT---45
0037-- 1 ---01
0038--XTO---23
0039-- 0 ---00
0040--CLX---37
0041--XTO---23
0042-- 1 ---01
0043-- 9 ---11
0044--XTO---23
0045-- 2 ---02
0046-- 0 ---00
0047--LBL---51
0048-- B ---66
0049--FMT---42
0050--FMT---42
0051--/!0---40
0052--DIV---35
0053-- N ---73
0054--FMT---42
0055--STP---41
0056--XTO---23
0057-- 1 ---01
0058-- 0 ---00
0059-- 8 ---10
0060--PNT---45
0061--INT---64
0062-- UP---27
0063--EEX---26
0064-- 2 ---02
0065--DIV---35
0066-- DN---25
0067-- UP---27
0068--INT---64
0069-- - ---34
0070--EEX---26
0071-- 2 ---02
0072-- X ---36
0073--YTO---40
0074-- 8 ---10
0075-- 9 ---11
0076--FMT---42
0077-- 4 ---04
0078-- 1 ---01
0079--FMT---42
0080--SFL---54
0081--FMT---42
0082--CNT---47
0083--FMT---42
0084--FMT---42
0085--YTO---40
0086-- E ---60
0087--XTO---23
0088--CNT---47
0089-- π ---56
0090-- 0 ---71
0091--IND---31
0092-- E ---60
0093-- a ---13
0094--CNT---47
0095-- A ---62
0096-- N ---73
0097-- D ---63
0098--CLR---20
0099-- π ---56
0100-- A ---62
0101-- π ---56
0102-- L ---60
0103-- a ---13
0104--FMT---42
0105--STP---41
0106-- 1 ---01
0107--XTO---23
0108-- a ---13
0109--FMT---42
0110-- 4 ---04
0111-- 1 ---01
0112--FMT---42
0113-- 1 ---01
0114--FMT---42
0115--PSE---57
0116--PSE---57
0117--PSE---57
0118--CNT---47
0119--CNT---47
0120--LBL---51
0121-- C ---61
0122--FMT---42
0123-- 3 ---03
0124-- 3 ---03
0125-- . ---21
0126-- UP---27
0127--FMT---42
0128-- 4 ---04
0129-- 1 ---01
0130--FMT---42
0131-- 1 ---01
0132--FMT---42
0133-- a ---13
0134-- UP---27
0135--XFR---67
0136-- 8 ---10
0137-- 9 ---11
0138--X=Y---50
0139-- DN---25
0140--GTO---44
0141--LBL---51
0142-- D ---63
0143-- 1 ---01
0144-- 7 ---07
0145--X=Y---50
0146-- DN---25
0147--GTO---44
0148--LBL---51
0149-- D ---63
0150-- DN---25
```

Table 11 General Fixture Calibration Program (HP 9810A)- 16 Pins (cont)

```
0151-- [illegible]-15
0152--LBL---26
0153--CHS---32
0154-- 3 ---03
0155--X>Y---53
0156--CLX---37
0157--XEY---30
0158--CNT---47
0159--CNT---47
0160--LBL---51
0161-- D ---63
0162-- DN---25
0163-- K ---55
0164-- 4 ---04
0165--XTO---23
0166-- 8 ---10
0167-- 9 ---11
0168-- a ---13
0169-- UP---27
0170-- 2 ---02
0171-- X ---36
0172-- 1 ---01
0173-- 9 ---11
0174-- + ---33
0175--YTO---40
0176-- b ---14
0177--XFR---67
0178--IND---31
0179-- b ---14
0180-- UP---27
0181--INT---64
0182-- - ---34
0183-- UP---27
0184--EEX---26
0185-- 5 ---05
0186--DIV---35
0187-- DN---25
0188--XEY---30
0189-- UP---27
0190-- 1 ---01
0191-- 0 ---00
0192-- X ---36
0193--XFR---67
0194-- 8 ---10
0195-- 8 ---10
0196-- X ---36
0197-- DN---25
0198-- + ---33
0199--YTO---40
0200-- 8 ---10

0201-- [illegible] 07
0202--CNT---47
0203-- 1 ---01
0204--XTO---23
0205-- + ---33
0206-- b ---14
0207--XFR---67
0208--IND---31
0209-- b ---14
0210-- UP---27
0211--INT---64
0212-- - ---34
0213-- UP---27
0214--EEX---26
0215-- 7 ---07
0216--DIV---35
0217--RUP---22
0218--XEY---30
0219--XFR---67
0220-- 8 ---10
0221-- 8 ---10
0222-- X ---36
0223-- X ---36
0224--RUP---22
0225--XEY---30
0226-- X ---36
0227-- X ---36
0228-- X ---36
0229-- DN---25
0230-- + ---33
0231-- YE---24
0232-- + ---33
0233-- 8 ---10
0234-- 7 ---07
0235-- DN---25
0236-- K ---55
0237-- 5 ---05
0238-- UP---27
0239-- 8 ---10
0240-- 9 ---11
0241--XFR---67
0242-- + ---33
0243-- a ---13
0244--XTO---23
0245-- b ---14
0246--YTO---40
0247--IND---31
0248-- b ---14
0249-- 1 ---01
0250-- E ---60

0251-- [illegible]---47
0252--CNT---47
0253-- 1 ---01
0254-- 8 --- 10
0255-- UP---27
0256-- a ---13
0257--X<Y---52
0258--PSE---57
0259--GTO---44
0260--LBL---51
0261-- C ---61
0262--XFR---67
0263-- 1 ---01
0264-- 7 ---07
0265--XTO---23
0266--DIV---35
0267-- 1 ---01
0268-- 0 ---00
0269-- 6 ---06
0270--CNT---47
0271-- 8 ---10
0272-- 9 ---11
0273--XFR---67
0274-- + ---33
0275-- 8 ---10
0276-- 9 ---11
0277--XTO---23
0278-- b ---14
0279--XFR---67
0280-- 1 ---01
0281-- 8 ---10
0282--XTO---23
0283--IND---31
0284--DIV---35
0285-- b ---14
0286-- 9 ---11
0287-- 0 ---00
0288--XTO---23
0289-- a ---13
0290--CLX---37
0291-- UP---27
0292--LBL---51
0293-- E ---60
0294--XFR---67
0295--IND---31
0296-- a ---13
0297-- + ---33
0298-- 1 ---01
0299-- E ---60
0300-- 1 ---01
```

Table 11 General Fixture Calibration Program (HP 9810A)- 16 Pins (cont)

```
0301-- 9 ---00
0302-- 6 ---06
0303-- UP---27
0304-- a ---13
0305--X<Y---52
0306-- DN---25
0307--GTO---44
0308--LBL---51
0309-- E ---60
0310-- DN---25
0311--YTO---40
0312-- 1 ---01
0313-- 0 ---00
0314-- 7 ---07
0315--FMT---42
0316-- 4 ---04
0317-- 8 ---10
0318--FMT---42
0319--CLR---20
0320--SFL---54
0321-- UP---27
0322-- DN---25
0323--CLR---20
0324-- UP---27
0325--CNT---47
0326--CNT---47
0327--CNT---47
0328--CNT---47
0329--CNT---47
0330--CNT---47
0331--CNT---47
0332--CNT---47
0333--CNT---47
0334--CNT---47
0335-- UP---27
0336--IFG---43
0337--FMT---42
0338--CNT---47
0339--FMT---42
0340-- 4 ---04
0341-- . ---21
0342-- 1 ---01
0343-- 0 ---00
0344-- . ---21
0345-- 3 ---03
0346--CNT---47
0347--XFR---67
0348-- 1 ---01
0349-- 0 ---00
0350-- 8 ---10
0351--CNT---47
0352--FMT---42
0353-- 4 ---04
0354-- 8 ---10
0355--FMT---42
0356--YTO---40
0357--DIV---35
0358-- N ---73
0359--CNT---47
0360-- UP---27
0361-- - ---34
0362-- UP---27
0363--PNT---45
0364--CLR---20
0365--SFL---54
0366--XEY---30
0367--CLR---20
0368-- π ---56
0369-- 0 ---71
0370-- a ---13
0371--XTO---23
0372--CNT---47
0373--CNT---47
0374--CNT---47
0375--CNT---47
0376--CNT---47
0377--CNT---47
0378--CNT---47
0379-- M ---70
0380-- I ---65
0381-- L ---72
0382-- L ---72
0383-- I ---65
0384--IND---31
0385-- A ---62
0386--XTO---23
0387--XTO---23
0388--YTO---40
0389--CNT---47
0390-- 0 ---71
0391--1/X---17
0392--XTO---23
0393--CLR---20
0394--SFL---54
0395--XEY---30
0396--FMT---42
0397-- 9 ---11
0398-- 0 ---00
0399--XTO---23
0400-- a ---13
0401-- 1 ---01
0402--STO---23
0403-- b ---14
0404--LBL---51
0405-- F ---16
0406--FMT---42
0407-- 4 ---04
0408-- . ---21
0409-- 4 ---04
0410-- . ---21
0411-- 0 ---00
0412-- b ---14
0413--FMT---42
0414-- 4 ---04
0415-- 8 ---10
0416--PNT---45
0417--CNT---47
0418--FMT---42
0419-- 4 ---04
0420-- . ---21
0421-- 1 ---01
0422-- 7 ---07
0423-- . ---21
0424-- 4 ---04
0425--XFR---67
0426--IND---31
0427-- a ---13
0428--FMT---42
0429-- 4 ---04
0430-- 8 ---10
0431--FMT---42
0432--PNT---45
0433--CLR---20
0434--SFL---54
0435--XEY---30
0436--FMT---42
0437-- 1 ---01
0438-- UP---27
0439-- E ---60
0440-- 1 ---01
0441-- 7 ---07
0442-- UP---27
0443-- b ---14
0444--X<Y---52
0445--GTO---44
0446--LBL---51
0447-- F ---16
0448--CNT---47
0449--XFR---67
0450-- 1 ---01
```

Table 11 General Fixture Calibration Program (HP 9810A) - 16 Pins (cont)

```
0451--  0  ---00
0452--  6  ---06
0453--FMT---42
0454--  4  ---04
0455--  .  ---21
0456--  1  ---01
0457--  0  ---00
0458--  .  ---21
0459--  4  ---04
0460--FMT---42
0461--  4  ---04
0462--  8  ---10
0463--FMT---42
0464--CLR---20
0465--  I  ---65
0466--  N  ---73
0467--  C  ---61
0468--  I  ---65
0469--  D  ---63
0470--  E  ---60
0471--  N  ---73
0472--XTO---23
0473--CNT---47
0474--  #  ---56
0475--  O  ---71
0476--IND---31
0477--  E  ---60
0478--  a  ---13
0479--CNT---47
0480--  UP---27
0481--  -  ---34
0482--  UP---27
0483--CNT---47
0484--PNT---45
0485--CNT---47
0486--  UP---27
0487--  M  ---70
0488--  UP---27
0489--IND---31
0490--CLR---20
0491--SFL---54
0492--XEY---30
0493--CLR---20
0494--XTO---23
0495--  O  ---71
0496--XTO---23
0497--  A  ---62
0498--  L  ---72
0499--CNT---47
0500--  #  ---56
0501--  G  ---71
0502--IND---31
0503--  E  ---60
0504--  a  ---13
0505--CNT---47
0506--  O  ---71
0507--1/X---17
0508--XTO---23
0509--CNT---47
0510--  UP---27
0511--  -  ---34
0512--  UP---27
0513--FMT---42
0514--XFR---67
0515--  1  ---01
0516--  0  ---00
0517--  6  ---06
0518--  UP---27
0519--XFR---67
0520--  1  ---01
0521--  0  ---00
0522--  7  ---07
0523--DIV---35
0524--XEY---30
0525--  K  ---55
0526--  4  ---04
0527--  UP---27
0528--  5  ---05
0529--  X  ---36
0530--YTO---40
0531--IND---31
0532--  0  ---00
0533--YTO---40
0534--  +  ---33
0535--  1  ---01
0536--  9  ---11
0537--  DN---25
0538--  UP---27
0539--XS0---12
0540--XTO---23
0541--  +  ---33
0542--  2  ---02
0543--  0  ---00
0544--RUP---22
0545--FMT---42
0546--  4  ---04
0547--  8  ---10
0548--PNT---45
0549--CNT---47
0550--FMT---42
0551--  -  ---34
0552--  9  ---11
0553--FMT---42
0554--CNT---47
0555--  UP---27
0556--  M  ---70
0557--  UP---27
0558--IND---31
0559--CLR---20
0560--SFL---54
0561--CLR---20
0562--XEY---30
0563--  L  ---72
0564--  O  ---71
0565--YTO---40
0566--YTO---40
0567--  UP---27
0568--  8  ---10
0569--  D  ---63
0570--  UP---27
0571--  B  ---66
0572--  UP---27
0573--  9  ---11
0574--  UP---27
0575--CNT---47
0576--  UP---27
0577--  -  ---34
0578--FMT---42
0579--XFR---67
0580--IND---31
0581--  0  ---00
0582--FMT---42
0583--  4  ---04
0584--  8  ---10
0585--PNT---45
0586--CNT---47
0587--FMT---42
0588--  5  ---05
0589--CLX---26
0590--FMT---42
0591--FMT---42
0592--  a  ---13
0593--  E  ---60
0594--  C  ---61
0595--  O  ---71
0596--  a  ---13
0597--  D  ---63
0598--IFG---43
0599--FMT---42
0600--SIP---41
```

Table II

General Fixture Calibration Program (HP 9810A)- 16 Pins (cont)

```
0601 - 1 ---01
0602-- 9 ---11
0603-- UP---27
0604-- 9 ---11
0605-- 0 ---00
0606--FMT---42
0607-- 5 ---05
0608--XTO---23
0609-- 1 ---01
0610--XTO---23
0611-- + ---33
0612-- 0 ---00
0613--CNT---47
0614-- 1 ---01
0615-- 7 ---07
0616-- UP---27
0617--XFR---67
0618-- 0 ---00
0619--X<Y---52
0620--GTO---44
0621--LBL---51
0622-- B ---66
0623--CNT---47
0624--XFR---67
0625-- 1 ---01
0626-- 9 ---11
0627-- UP---27
0628-- 1 ---01
0629-- 6 ---06
0630--DIV---35
0631--YTO---40
0632-- 1 ---01
0633-- 9 ---11
0634-- YE---24
0635-- 2 ---02
0636-- 0 ---00
0637--DIV---35
0638--XFR---67
0639-- 1 ---01
0640-- 9 ---11
0641--X≤0---12
0642-- - ---34
0643-- DN---25
0644-- Γ ---76
0645--XTO---23
0646-- 2 ---02
0647-- 0 ---00
0648--FMT---42
0649--FMT---42
0650-- ‖ ---73
0651-- Γ ---60
0652--INT---31
0653--CNT---47
0654-- π ---56
0655-- A ---62
0656-- π ---56
0657-- E ---60
0658-- α ---13
0659--FMT---42
0660--STP---41
0661--FMT---42
0662-- 4 ---04
0663-- 8 ---10
0664--FMT---42
0665--CLR---20
0666--SFL---54
0667--XEY---30
0668-- π ---56
0669-- D ---71
0670-- α ---13
0671--XTO---23
0672--CNT---47
0673--CNT---47
0674--CNT---47
0675--CNT---47
0676--CNT---47
0677--CNT---47
0678--CNT---47
0679-- L ---72
0680-- D ---71
0681--YTO---40
0682--YTO---40
0683-- UP---27
0684-- 8 ---10
0685-- D ---63
0686-- UP---27
0687-- B ---66
0688-- UP---27
0689-- 9 ---11
0690-- UP---27
0691--CLR---20
0692--SFL---54
0693--XEY---30
0694--FMT---42
0695-- 1 ---01
0696--XTO---23
0697-- α ---13
0698--LBL---51
0699-- G ---15
0700--FMT---42
0701-- 4 ---04
0702-- . ---21
0703-- 4 ---04
0704-- . ---21
0705-- 0 ---00
0706-- α ---13
0707--FMT---42
0708-- 4 ---04
0709-- 8 ---10
0710--PNT---45
0711--CNT---47
0712--FMT---42
0713-- 4 ---04
0714-- . ---21
0715-- 1 ---01
0716-- 4 ---04
0717-- . ---21
0718-- 4 ---04
0719--XFR---67
0720--IND---31
0721-- α ---13
0722--FMT---42
0723-- 4 ---04
0724-- 8 ---10
0725--FMT---42
0726--PNT---45
0727--CLR---20
0728--SFL---54
0729--XEY---30
0730--FMT---42
0731-- 1 ---01
0732-- E ---60
0733-- 1 ---01
0734-- 7 ---07
0735-- UP---27
0736-- α ---13
0737--X<Y---52
0738--GTO---44
0739--LBL---51
0740-- G ---15
0741--CNT---47
0742--FMT---42
0743-- 4 ---04
0744-- . ---21
0745-- 9 ---11
0746-- . ---21
0747-- 4 ---04
0748--CNT---47
0749--FMT---42
0750-- 4 ---04
```

Table 11 General Fixture Calibration Program (HP9810A)- 16 Pins (cont)

```
0751--  .  ---10
0752--FMT---42
0753--CLR---20
0754--  M  ---70
0755--  E  ---60
0756--  A  ---62
0757--  N  ---73
0758--CNT---47
0759--  UP---27
0760--  -  ---34
0761--FMT---42
0762--CNT---47
0763--XFR---67
0764--  1  ---01
0765--  9  ---11
0766--FMT---42
0767--  4  ---04
0768--  8  ---10
0769--FMT---42
0770--PNT---45
0771--CLR---20
0772--SFL---54
0773--XEY---30
0774--CLR---20
0775--YTO---40
0776--XTO---23
0777--  A  ---62
0778--  N  ---73
0779--  D  ---63
0780--  A  ---62
0781--  a  ---13
0782--  D  ---63
0783--CNT---47
0784--  E  ---60
0785--  a  ---13
0786--  a  ---13
0787--  O  ---71
0788--  a  ---13
0789--CNT---47
0790--  UP---27
0791--  -  ---34
0792--FMT---42
0793--CNT---47
0794--XFR---67
0795--  2  ---02
0796--  0  ---00
0797--FMT---42
0798--  4  ---04
0799--  8  ---10
0800--FMT---42
```

```
0801--PNT---45
0802--CLR---20
0803--SFL---54
0804--XEY---30
0805--CLR---20
0806--  A  ---62
0807--  B  ---66
0808--YTO---40
0809--  O  ---71
0810--  L  ---72
0811--1/X---17
0812--XTO---23
0813--  E  ---60
0814--CNT---47
0815--  L  ---72
0816--  O  ---71
0817--YTO---40
0818--YTO---40
0819--CNT---47
0820--  F  ---16
0821--  A  ---62
0822--  C  ---61
0823--XTO---23
0824--  O  ---71
0825--  a  ---13
0826--CNT---47
0827--  UP---27
0828--  -  ---34
0829--FMT---42
0830--XFR---67
0831--  1  ---01
0832--  9  ---11
0833--  UP---27
0834--  1  ---01
0835--  0  ---00
0836--DIV---35
0837--  DN---25
0838--  K  ---55
0839--  5  ---05
0840--FMT---42
0841--  4  ---04
0842--  8  ---10
0843--PNT---45
0844--CNT---47
0845--FMT---42
0846--FMT---42
0847--  N  ---73
0848--  E  ---60
0849--  YE---24
0850--XTO---23
```

```
0851--CN----47
0852--  F  ---16
0853--  a  ---13
0854--  E  ---60
0855--  b  ---14
0856--  .  ---21
0857--FMT---42
0858--STP---41
0859--END---46
```

Table 12 General Fixture Calibration Program Data Register Allocation

a	CHANNEL COUNTER	
b	INDIRECT AND SCRATCH	
0	FREQUENCY, PORT COUNTER	
1	LOSS IN dB WITH INPUT PORT #	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10
11		11
12		12
13		13
14		14
15		15
16		16
17	INCIDENT POWER COUPLER FACTOR	
18	REFLECTED POWER COUPLER FACTOR	
19	M	
20	E	
21	DETECTOR COEFFICIENTS - $B_{(1)}$ & B_1 - DETECTOR #	1
22	B_2 & B_3	1
23	B_0 & B_1	2

Table 12 (Continued)

24	DETECTOR COEFFICIENTS	B_2 & B_3 - DETECTOR #	2
25		B_0 & B_1	3
26		B_2 & B_3	3
27		B_0 & B_1	4
28		B_2 & B_3	4
29		B_0 & B_1	5
30		B_2 & B_3	5
31		B_0 & B_1	6
32		B_2 & B_3	6
33		B_0 & B_1	7
34		B_2 & B_3	7
35		B_0 & B_1	8
36		B_2 & B_3	8
37		B_0 & B_1	9
38		B_2 & B_3	9
39		B_0 & B_1	10
40		B_2 & B_3	10
41		B_0 & B_1	11
42		B_2 & B_3	11
43		B_0 & B_1	12
44		B_2 & B_3	12
45		B_0 & B_1	13
46		B_2 & B_3	13
47		B_0 & B_1	14
48		B_2 & B_3	14
49		B_0 & B_1	15

Table 12 (Continued)

50	DETECTOR COEFFICIENTS -	B_2 & B_3	DETECTOR # 15
51		B_0 & B_1	16
52		B_2 & B_3	16
53		B_0 & B_1	17
54		B_2 & B_3	17
55	SPARE		
56	SPARE		
57	SPARE		
58	SPARE		
59	SPARE		
60	SPARE		
61	SPARE		
62	SPARE		
63	SPARE		
64	SPARE		
65	SPARE		
66	SPARE		
67	SPARE		
68	SPARE		
69	SPARE		
70	SPARE		
71	SPARE		
72	SPARE		
73	SPARE		
74	SPARE		
75	SPARE		

Table 12 (Continued)

76	SPARE
77	SPARE
78	SPARE
79	SPARE
80	SPARE
81	SPARE
82	SPARE
83	SPARE
84	SPARE
85	SPARE
86	SPARE
87	TEMPORARY STORAGE FOR CALCULATING P
88	LOG V
89	INPUT PORT
90	POWER OUT OF PORT # 1
91	2
92	3
93	4
94	5
95	6
96	7
97	8
98	9
99	10
100	11
101	12

Table 12 (Continued)

102	POWER OUT OF PORT	13
103		14
104		15
105		16
106	INCIDENT POWER	
107	TOTAL POWER OUT	
108	S/N	

Table 13 Dissipation Loss Data for 16 Pin DIP Test Fixture at 0.22 GHz

PORT	LOSS(dB)
1	0.1369
2	0.1790
3	0.1715
4	0.1532
5	0.1626
6	0.0748
7	0.1650
8	0.1698
9	0.1833
10	0.1623
11	0.1764
12	0.1537
13	0.1333
14	0.1734
15	0.1844
16	0.1738

MEAN = 0.1596

STANDARD ERROR = 0.0262

ABSOLUTE LOSS FACTOR = 1.0374

Table 14 Dissipation Loss Data for 16 Pin DIP Test Fixture at 0.91 GHz

PORT	LOSS(dB)
1	0.3317
2	0.4721
3	0.4837
4	0.5139
5	0.4787
6	0.4157
7	0.3713
8	0.4804
9	0.5095
10	0.3941
11	0.4221
12	0.4409
13	0.5746
14	0.6120
15	0.5008
16	0.6633

MEAN = 0.4791

STANDARD ERROR = 0.0839

ABSOLUTE LOSS FACTOR = 1.1166

Table 15 Dissipation Loss Data for 16 Pin DIP Test Fixture at 3 GHz

PORT	LOSS(dB)
1	0.1611
2	0.2371
3	0.2189
4	0.1635
5	0.1733
6	0.1989
7	0.2347
8	0.1972
9	0.2017
10	0.2070
11	0.2376
12	0.1697
13	0.1321
14	0.1882
15	0.2496
16	0.1815

MEAN = 0.1970

STANDARD ERROR = 0.0319

ABSOLUTE LOSS FACTOR = 1.0464

Table 16 Dissipation Loss Data for 16 Pin DIP Test Fixture at 5.6 GHz

PORT	LOSS(dB)
1	1.0181
2	0.7169
3	1.0751
4	0.5275
5	0.5637
6	1.2343
7	0.6952
8	0.9124
9	0.9274
10	0.7600
11	1.2159
12	0.8551
13	0.6707
14	1.4796
15	0.7602
16	1.0528

MEAN = 0.9044

STANDARD ERROR = 0.2512

ABSOLUTE LOSS FACTOR = 1.2315

Table 17 Dissipation Loss Data for 16 Pin DIP Test Fixture at 9.1 GHz

PORT	LOSS(dB)
1	0.9107
2	0.5559
3	0.4131
4	0.7084
5	0.5642
6	0.6113
7	0.7256
8	1.3086
9	1.1167
10	0.6015
11	0.4778
12	0.4697
13	0.4818
14	0.5247
15	0.6945
16	1.1751

MEAN = 0.7089

STANDARD ERROR = 0.2661

ABSOLUTE LOSS FACTOR = 1.1773

Table 18 Dissipation Loss Data for 8 Pin TO-5 Test Fixture at 0.22 GHz

PORT	LOSS(dB)
1	0.1519
2	0.8181
3	0.1392
4	0.0000
5	0.1938
6	0.3123
7	0.3386
8	0.2383

MEAN = 0.3079

STANDARD ERROR = 0.2255

ABSOLUTE LOSS FACTOR = 1.0735

Table 19 Dissipation Loss Data for 8 Pin TO-5 Test Fixture at 0.91 GHz

PORT	LOSS(dB)
1	0.4150
2	1.0125
3	0.5663
4	0.4030
5	0.3797
6	0.4132
7	0.4316
8	0.4331

MEAN = 0.5068

STANDARD ERROR = 0.1983

ABSOLUTE LOSS FACTOR = 1.1238

Table 20 Dissipation Loss Data for 8 Pin TO-5 Test Fixture at 3 GHz

PORT	LOSS(dB)
1	0.3019
2	0.6478
3	0.3319
4	0.2966
5	0.2757
6	0.3976
7	0.4162
8	0.3973

MEAN = 0.3831

STANDARD ERROR = 0.1117

ABSOLUTE LOSS FACTOR = 1.0922

Table 21 Dissipation Loss Data for 8 Pin TO-5 Test Fixture at 5.6 GHz

PORT	LOSS(dB)
1	0.6941
2	1.1559
3	0.8308
4	0.9468
5	0.8308
6	1.1359
7	0.9228
8	0.9321

MEAN = 0.9311

STANDARD ERROR = 0.1454

ABSOLUTE LOSS FACTOR = 1.2391

Table 22 Dissipation Loss Data for 8 Pin TO-5 Test Fixture at 9.1 GHz

PORT	LOSS(dB)
1	2.3016
2	1.7793
3	1.8986
4	2.0717
5	2.1899
6	2.6554
7	2.4368
8	2.6065

MEAN = 2.2425

STANDARD ERROR = 0.2977

ABSOLUTE LOSS FACTOR = 1.6759

TABLE 23 EXAMPLE OF 741 INTERFERENCE SUSCEPTIBILITY DATA

S/N = 330

P(mW)	C.F.(dB)	VOUT	IOUT	VNI	INI	VON2	ION2	VON6
-0.0001	0.000	-4.927	9.85	0.00	-0.0106	-11.82	-0.0278	-11.82
0.0384	2.253	-4.988	9.98	0.00	-0.0110	-11.82	-0.0280	-11.82
0.0596	2.229	-5.019	10.04	0.00	-0.0110	-11.82	-0.0282	-11.82
0.0851	2.493	-5.068	10.14	-0.00	-0.0112	-11.82	-0.0284	-11.81
0.2514	2.519	-5.380	10.76	0.00	-0.0110	-11.81	-0.0300	-11.81
0.4498	2.530	-5.772	11.54	0.00	-0.0111	-11.80	-0.0314	-11.80
0.9689	2.508	-6.652	13.30	-0.00	-0.0112	-11.78	-0.0354	-11.78
1.6265	2.512	-7.564	15.13	-0.00	-0.0112	-11.75	-0.0394	-11.75
3.0516	2.496	-8.912	17.82	-0.00	-0.0111	-11.72	-0.0444	-11.72
10.5494	2.446	-8.993	17.99	-0.00	-0.0109	-11.72	-0.0446	-11.72
18.5502	2.419	-8.972	17.94	0.00	-0.0108	-11.72	-0.0442	-11.72
34.0799	2.383	-8.922	17.84	-0.00	-0.0108	-11.73	-0.0442	-11.72
54.5367	2.354	-8.843	17.69	0.00	-0.0108	-11.73	-0.0438	-11.72
103.4030	2.453	9.829	-19.66	0.00	-0.0081	-11.94	-0.0054	-11.95
134.7200	2.355	9.732	-19.46	0.00	-0.0099	-11.94	-0.0054	-11.94
198.5100	2.209	9.506	-19.01	0.00	-0.0107	-11.94	-0.0056	-11.94
277.1050	2.085	9.195	-18.39	0.00	-0.0107	-11.94	-0.0060	-11.94
396.2030	1.961	8.721	-17.44	0.00	-0.0110	-11.94	-0.0064	-11.94
521.0260	1.867	8.186	-16.37	0.00	-0.0109	-11.93	-0.0068	-11.94
760.4520	1.713	7.254	-14.51	0.00	-0.0105	-11.86	-0.0222	-11.93

P(mW)	ION6	VCC+	ICC+	VCC-	ICC-	VII	III
-0.0001	-0.0278	11.93	0.80	-11.84	-11.50	0.0032	0.4940
0.0384	-0.0280	11.93	0.80	-11.84	-11.80	-0.0024	0.4996
0.0596	-0.0284	11.93	0.90	-11.84	-11.70	-0.0052	0.5024
0.0851	-0.0286	11.93	0.90	-11.84	-11.80	-0.0097	0.5068
0.2514	-0.0298	11.93	0.90	-11.83	-12.50	-0.0381	0.5353
0.4498	-0.0316	11.93	0.80	-11.82	-13.40	-0.0737	0.5708
0.9689	-0.0356	11.93	0.90	-11.80	-15.40	-0.1539	0.6510
1.6265	-0.0396	11.93	1.30	-11.77	-17.70	-0.2366	0.7338
3.0516	-0.0446	11.93	0.90	-11.74	-20.30	-0.3596	0.8568
10.5494	-0.0454	11.93	1.00	-11.74	-20.50	-0.3666	0.8638
18.5502	-0.0452	11.93	0.90	-11.74	-20.50	-0.3647	0.8618
34.0799	-0.0448	11.93	1.00	-11.74	-20.30	-0.3598	0.8569
54.5367	-0.0444	11.93	0.90	-11.74	-20.10	-0.3516	0.8487
103.4030	-0.0052	11.71	22.00	-11.97	-0.50	1.4130	-0.9157
134.7200	-0.0054	11.71	21.90	-11.96	-0.60	1.5130	-1.0157
198.5100	-0.0054	11.71	21.70	-11.96	-0.70	1.7090	-1.2117
277.1050	-0.0058	11.72	21.40	-11.96	-0.90	1.9090	-1.4117
396.2030	-0.0062	11.72	20.70	-11.96	-1.00	2.1450	-1.6477
521.0260	-0.0064	11.73	19.80	-11.96	-1.10	2.3260	-1.8287
760.4520	-0.0066	11.75	18.20	-11.96	-1.10	2.5610	-2.0636

ALL VOLTAGES IN VOLTS
ALL CURRENTS IN MILLIAMPS

Table 24 7400 Interference Test Program (HP9810A)

```
0000--CLR---20
0001--FMT---42
0002--XFR---67
0003--XFR---67
0004-- 2 ---02
0005-- 4 ---04
0006--PNT---45
0007--LBL---51
0008-- A ---62
0009--FMT---42
0010-- 4 ---04
0011-- 1 ---01
0012--FMT---42
0013--SFL---54
0014--FMT---42
0015--PSE---57
0016--FMT---42
0017--FMT---42
0018--YTO---40
0019--DIV---35
0020-- N ---73
0021--FMT---42
0022--STP---41
0023--XTO---23
0024-- 3 ---03
0025-- 0 ---00
0026--PNT---45
0027-- UP---27
0028--EEX---26
0029-- 3 ---03
0030--DIV---35
0031-- DN---25
0032-- UP---27
0033--INT---64
0034-- - ---34
0035-- 1 ---01
0036-- 0 ---00
0037-- X ---36
0038-- DN---25
0039--INT---64
0040-- UP---27
0041-- 1 ---01
0042--XTO---23
0043-- 2 ---02
0044-- 3 ---03
0045--X=Y---50
0046--CNT---47
0047-- 1 ---01
0048-- 0 ---00
0049-- + ---33
0050--YTO---40
0051-- 2 ---02
0052-- 4 ---04
0053--CLX---37
0054--XTO---23
0055-- 3 ---03
0056-- 2 ---02
0057--XTO---23
0058-- 4 ---04
0059-- 1 ---01
0060--LBL---51
0061-- B ---66
0062--FMT---42
0063-- 4 ---04
0064-- 1 ---01
0065--FMT---42
0066-- 1 ---01
0067--FMT---42
0068--STP---41
0069-- 1 ---01
0070--XTO---23
0071-- a ---13
0072--SFL---54
0073--LBL---51
0074-- C ---61
0075--FMT---42
0076-- 3 ---03
0077-- 3 ---03
0078-- . ---21
0079-- UP---27
0080--FMT---42
0081-- 4 ---04
0082-- 1 ---01
0083--FMT---42
0084-- 1 ---01
0085--FMT---42
0086-- 1 ---01
0087-- 5 ---05
0088-- UP---27
0089-- a ---13
0090--X>Y---53
0091--GTO---44
0092--LBL---51
0093-- I ---65
0094--CNT---47
0095--RUP---22
0096-- K ---55
0097-- 4 ---04
0098--XTO---23
0099-- 2 ---02
0100-- 6 ---06
0101--XFR---67
0102-- 1 ---01
0103-- 6 ---06
0104-- UP---27
0105--INT---64
0106-- - ---34
0107-- UP---27
0108--EEX---26
0109-- 5 ---05
0110--DIV---35
0111--RUP---22
0112--XEY---30
0113-- 1 ---01
0114-- 0 ---00
0115-- X ---36
0116-- DN---25
0117--XTO---23
0118-- 4 ---04
0119-- 6 ---06
0120--YTO---40
0121-- 4 ---04
0122-- 5 ---05
0123--XFR---67
0124-- 1 ---01
0125-- 7 ---07
0126-- UP---27
0127--INT---64
0128-- - ---34
0129-- UP---27
0130--EEX---26
0131-- 7 ---07
0132--DIV---35
0133-- DN---25
0134--CHS---32
0135--XTO---23
0136-- 4 ---04
0137-- 8 ---10
0138--YTO---40
0139-- 4 ---04
0140-- 7 ---07
0141--XFR---67
0142--IND---31
0143-- a ---13
0144-- UP---27
0145-- 4 ---04
0146-- 5 ---05
0147--XTO---23
0148-- b ---14
0149--LBL---51
0150-- D ---63
```

Table 24 7400 Interference Test Program (HP 9810A) (cont)

```
0151-- 6 0---44
0152--2 R---77
0153--LBL---51
0154-- H ---74
0155--XTO---23
0156--IND---31
0157-- - ---34
0158-- b ---14
0159-- 1 ---01
0160--XTO---23
0161-- + ---33
0162-- b ---14
0163-- 4 ---04
0164-- 9 ---11
0165-- UP---27
0166-- b ---14
0167--X<Y---52
0168-- DN---25
0169--GTO---44
0170--LBL---51
0171-- D ---63
0172--XFR---67
0173-- 2 ---02
0174-- 6 ---06
0175--XTO---23
0176-- b ---14
0177--XFR---67
0178-- X ---36
0179-- 4 ---04
0180-- 6 ---06
0181--XFR---67
0182-- + ---33
0183-- 4 ---04
0184-- 5 ---05
0185-- UP---27
0186-- b ---14
0187--XS0---12
0188--XFR---67
0189-- X ---36
0190-- 4 ---04
0191-- 7 ---07
0192-- + ---33
0193-- b ---14
0194--XS0---12
0195--XFR---67
0196-- X ---36
0197-- b ---14
0198--XFR---67
0199-- X ---36
0200-- 4 ---04
0201-- 5 ---10
0202-- - ---34
0203-- DN---25
0204-- K ---55
0205-- 5 ---05
0206-- UP---27
0207-- 1 ---01
0208-- 5 ---05
0209-- UP---27
0210-- a ---13
0211--X<Y---52
0212--GTO---44
0213--LBL---51
0214-- E ---60
0215--CNT---47
0216--XFF---67
0217-- 0 ---00
0218--INT---64
0219--XEY---30
0220--EEX---26
0221-- 6 ---06
0222--DIV---35
0223-- DN---25
0224--DIV---35
0225-- 1 ---01
0226-- 8 ---10
0227--XFR---67
0228-- + ---33
0229-- 2 ---02
0230-- 4 ---04
0231--XTO---23
0232-- b ---14
0233-- YE---24
0234--IND---31
0235--DIV---35
0236-- b ---14
0237-- YE---24
0238--DIV---35
0239-- 1 ---01
0240-- 8 ---10
0241--XFR---67
0242-- 2 ---02
0243-- 3 ---03
0244-- UP---27
0245-- 9 ---11
0246-- X ---36
0247-- 2 ---02
0248-- 2 ---02
0249-- + ---33
0250--YTO---40
0251-- 1 ---14
0252-- DN---25
0253--YTO---40
0254--IND---31
0255-- b ---14
0256--GTO---44
0257--LBL---51
0258-- J ---75
0259--LBL---51
0260-- E ---60
0261-- 2 ---02
0262-- 3 ---03
0263--XEY---30
0264-- 9 ---11
0265--XFR---67
0266-- X ---36
0267-- 2 ---02
0268-- 3 ---03
0269-- + ---33
0270--YTO---40
0271-- 2 ---02
0272-- 5 ---05
0273-- DN---25
0274--XFR---67
0275-- 1 ---01
0276-- 8 ---10
0277-- X ---36
0278-- 5 ---05
0279-- UP---27
0280-- a ---13
0281--X<Y---52
0282--GTO---44
0283--LBL---51
0284-- G ---15
0285--CNT---47
0286--XEY---30
0287-- 1 ---01
0288-- 1 ---01
0289--X=Y---50
0290--GTO---44
0291--LBL---51
0292-- G ---15
0293--CNT---47
0294-- DN---25
0295--YTO---40
0296--IND---31
0297-- + ---33
0298-- 2 ---02
0299-- 5 ---05
0300--GTO---44
```

Table 24 7400 Interference Test Program (HP 9810A) (cont)

```
0301--LBL---51
0302-- J ---75
0303--LBL---51
0304-- G ---15
0305-- 1 ---01
0306-- 8 ---10
0307--XFR---67
0308-- + ---33
0309-- a ---13
0310--XTO---23
0311-- b ---14
0312-- DN---25
0313-- YE---24
0314--IND---31
0315-- X ---36
0316-- b ---14
0317--XFR---67
0318-- 2 ---02
0319-- 4 ---04
0320-- UP---27
0321-- a ---13
0322--X=Y---50
0323-- DN---25
0324--GTO---44
0325--LBL---51
0326-- F ---16
0327-- DN---25
0328--YTO---40
0329--IND---31
0330-- + ---33
0331-- 2 ---02
0332-- 5 ---05
0333--GTO---44
0334--LBL---51
0335-- J ---75
0336--LBL---51
0337-- F ---16
0338--XFR---67
0339-- 0 ---00
0340-- UP---27
0341--INT---64
0342-- - ---34
0343-- DN---25
0344--DIV---35
0345--YTO---40
0346--IND---31
0347-- + ---33
0348-- 2 ---02
0349-- 5 ---05
0350--LBL---51
0351-- J ---75
0352-- 1 ---01
0353-- E ---60
0354--GTO---44
0355--LBL---51
0356-- C ---61
0357--LBL---51
0358-- I ---65
0359-- 2 ---02
0360-- 2 ---02
0361--XEY---30
0362-- a ---13
0363--X>Y---53
0364--GTO---44
0365--LBL---51
0366-- a ---13
0367--CNT---47
0368--PSE---57
0369--PSE---57
0370--IFG---43
0371-- DN---25
0372--GTO---44
0373--LBL---51
0374-- L ---72
0375--SFL---54
0376-- DN---25
0377-- YE---24
0378--IND---31
0379-- - ---34
0380-- 2 ---02
0381-- 5 ---05
0382--LBL---51
0383-- L ---72
0384-- 1 ---01
0385--XTO---23
0386-- + ---33
0387-- 2 ---02
0388-- 5 ---05
0389--YTO---40
0390--IND---31
0391-- 2 ---02
0392-- 5 ---05
0393--GTO---44
0394--LBL---51
0395-- J ---75
0396--LBL---51
0397-- a ---13
0398--FMT---42
0399-- 4 ---04
0400-- 1 ---01
0401--FMT---42
0402--SFL---54
0403--FMT---42
0404-- 2 ---02
0405-- 3 ---03
0406-- UP---27
0407-- 9 ---11
0408--XFR---67
0409-- X ---36
0410-- 2 ---02
0411-- 3 ---03
0412-- + ---33
0413--YTO---40
0414-- a ---13
0415--XFR---67
0416--IND---31
0417-- a ---13
0418--CHS---32
0419-- UP---27
0420-- 1 ---01
0421--CHS---32
0422-- L ---00
0423--XFR---67
0424--IND---31
0425-- a ---13
0426-- + ---33
0427--YTO---40
0428--IND---31
0429-- a ---13
0430--XEY---30
0431--DIV---35
0432--FMT---42
0433--FMT---42
0434-- π ---56
0435--CLR---20
0436--INT---64
0437--FMT---42
0438--PNT---45
0439-- DN---25
0440-- K ---55
0441-- 4 ---04
0442-- UP---27
0443-- 1 ---01
0444-- 0 ---00
0445-- X ---36
0446-- 1 ---01
0447-- E ---60
0448--YTO---40
0449--IND---31
0450-- a ---13
```

Table 24 7400 Interference Test Program (HP 9810A)(cont)

```
0451-  5 ---05
0452-- E ---60
0453--XFR---67
0454--IND---31
0455-- a ---13
0456--PNT---45
0457-- 1 ---01
0458--XTO---23
0459-- + ---33
0460-- 2 ---02
0461-- 3 ---03
0462--XFR---67
0463-- 2 ---02
0464-- 3 ---03
0465-- UP---27
0466-- 3 ---03
0467--X>Y---53
0468--GTO---44
0469--LBL---51
0470-- B ---66
0471--CNT---47
0472-- 1 ---01
0473-- 9 ---11
0474-- UP---27
0475-- 3 ---03
0476-- 0 ---00
0477--FMT---42
0478-- 5 ---05
0479--XTO---23
0480--GTO---44
0481--LBL---51
0482-- A ---62
0483--LBL---51
0484-- H ---74
0485--EEX---26
0486-- 3 ---03
0487-- X ---36
0488-- DN---25
0489-- UP---27
0490--INT---64
0491-- - ---34
0492-- UP---27
0493--EEX---26
0494-- 4 ---04
0495--DIV---35
0496-- DN---25
0497--S/R---77
0498--END---4E
```

Table 25 7400 Data Tape to Matrix Tape Conversion Program for HP 9830A

```
10 COM FS[20,9],A
20 DISP "FIRST MATRIX TAPE FILE#";
30 INPUT Q
40 DIM C[19]
50 DISP "FIRST FILE #, # OF FILES";
60 INPUT M,N
70 FOR I=0 TO N-1
80 LOAD  DATA M+I,C
90 IF I>0 THEN 110
100 A=C[1]
110 IF A#C[1] THEN 490
120 FOR J=1 TO 2
130 FOR K=1 TO 9
140 F[J+2*I,K]=C[K+1+9*(J-1)]
150 NEXT K
160 NEXT J
170 NEXT I
180 FOR I=1 TO 20
190 F[I,4]=1000*F[I,4]
200 F[I,6]=10*F[I,6]
210 F[I,8]=10*F[I,8]
220 F[I,9]=1000*F[I,9]
230 NEXT I
240 PRINT
250 PRINT
260 PRINT
270 WRITE (15,280)A
280 FORMAT 30X,"S/N =",F7.0
290 PRINT
300 PRINT
310 FORMAT "          P(mW)   C.F.(dB)   VCC   ICC       VIH      IIH",F4.0
320 WRITE (15,310)"      VOUT    IOUT     IGHD"
330 FOR I=1 TO 20
```

Table 25 7400 Data Tape to Matrix Tape Conversion Program (cont)

```
340 WRITE (15,350)F[I,1],F[I,2],F[I,3],F[I,4],F[I,5],F[I,6],F[I,7],F[I,8],F[I,9]
350 FORMAT 5X,F10.4,2F8.4,F8.3,4F8.4,F8.3
360 NEXT I
370 PRINT
380 PRINT
390 PRINT
400 PRINT
410 PRINT
420 PRINT
430 PRINT
440 STORE  DATA #5,Q
450 Q=Q+1
460 M=M+10
470 GOTO 70
480 END
490 DISP "S/N NOT ="A;C[1]
500 STOP
```

Table 26 General Plot Program from Matrix Tapes for 7400 for HP 9830A

```
10 COM FS[20,9],A
20 DIM C[19]
30 DISP "FIRST FILE #";
40 INPUT P
60 LOAD  DATA P
70 SCALE 0,8.5,0,10
80 OFFSET 2,1.5
90 XAXIS 0,1.5,0,6
100 YAXIS 0,0.7,0,7
110 FOR J=0 TO 3
120 PLOT (LGT(2)+J)*1.5,0,1
130 LABEL (*,1,3.4,PI/2,7/6)
140 CPLOT 0,-0.3
150 LABEL (*)"-";
160 PLOT (LGT(5)+J)*1.5,0,1
170 CPLOT 0,-0.3
180 LABEL (*)"-";
190 NEXT J
200 DISP "YMIN,YMAX";
210 INPUT N,M
220 SCALE -7/3,10/3,N-1.5*(M-N)/7,N+8.5*(M-N)/7
230 FOR I=-1 TO 3
240 LABEL (*,1.5,1.7,0,7/6)
250 PLOT I,N,1
260 CPLOT -2,-2
270 LABEL (310,1.5,1.7,0,7/6)10;
280 CPLOT 0,0.6
290 LABEL (320,1.125,1.7,0,7/6)I;
300 NEXT I
310 FORMAT F3.0
320 FORMAT F2.0
330 LABEL (*,1.5,1.7,0,7/6)
340 A=(M-N)/5
350 FOR I=0 TO 5
360 PLOT -1,N+A*I,1
370 CPLOT -7,-0.3
380 LABEL (400)N+A*I;
390 NEXT I
400 FORMAT F7.3
410 LABEL (*,1,0.8,0,7/6)
420 FOR I=1 TO 20
430 PLOT LGT(F[I,1]),ABS(F[I,7]),1
440 CPLOT -0.3,-0.3
450 LABEL (*)"*"
460 IPLOT 0,0,1
470 NEXT I
```

Table 26 General Plot Program from Matrix Tapes for 7400 for HP 9830A (cont)

```
480 PEN
490 SCALE 0,8.5,0,10
500 OFFSET 2,1.5
510 FOR I=1 TO 4
520 PLOT I*1.5,0,1
530 PLOT I*1.5,7,2
540 NEXT I
550 FOR I=1 TO 10
560 PLOT 0,I*0.7,1
570 PLOT 6,I*0.7,2
580 NEXT I
590 PEN
600 SCALE -7/3,10/3,N-1.5*(N-N)/7,N+8.5*(M-N)/7
610 FOR Q=P+1 TO P+9
620 LOAD  DATA Q
630 FOR I=1 TO 20
640 PLOT LGT(F[I,1]),ABS(F[I,7]),1
650 CPLOT -0.3,-0.3
660 LABEL (*)"*"
670 NEXT I
680 NEXT Q
690 PLOT 0.15,7.5,1
700 LABEL (*)A
710 END
```

Table 27 HP 9810A 741 Interference Program

```
0000--[Σ+]---42
0001--XFR---67
0002--XFR---67
0003-- 0 ---00
0004--PNT---45
0005--LBL---51
0006-- π ---56
0007-- 1 ---01
0008--XTO---23
0009-- 2 ---02
0010-- 0 ---00
0011--XFR---67
0012-- 5 ---05
0013-- 1 ---01
0014--FMT---42
0015-- 4 ---04
0016-- 2 ---02
0017--XTO---23
0018--FMT---42
0019--FMT---42
0020--YTO---40
0021--DIV---35
0022-- N ---73
0023--FMT---42
0024--STP---41
0025--XTO---23
0026-- 7 ---07
0027-- 6 ---06
0028--PNT---45
0029-- UP---27
0030--EEX---26
0031-- 2 ---02
0032--DIV---35
0033-- DN---25
0034-- UP---27
0035--INT---64
0036-- - ---34
0037-- 1 ---01
0038-- 0 ---00
0039-- X ---36
0040-- DN---25
0041--INT---64
0042-- UP---27
0043-- 5 ---05
0044--XEY---30
0045--X>Y---53
0046-- UP---27
0047-- 4 ---04
0048-- + ---33
0049-- DN---25
0050--RTO---23
0051-- 1 ---01
0052-- 7 ---07
0053--LBL---51
0054-- A ---62
0055--FMT---42
0056-- 4 ---04
0057-- 1 ---01
0058--FMT---42
0059--SFL---54
0060--FMT---42
0061--PSE---57
0062--PSE---57
0063--CLX---37
0064--XTO---23
0065-- 7 ---07
0066-- 8 ---10
0067--XTO---23
0068-- 9 ---11
0069-- 4 ---04
0070--CNT---47
0071-- 1 ---01
0072--XTO---23
0073-- 0 ---00
0074--LBL---51
0075-- C ---61
0076--FMT---42
0077-- 4 ---04
0078-- 1 ---01
0079--FMT---42
0080-- 1 ---01
0081--FMT---42
0082--XFR---67
0083-- 7 ---07
0084-- 3 ---03
0085-- UP---27
0086--XFR---67
0087-- 2 ---02
0088-- 0 ---00
0089--X=Y---50
0090--GTO---44
0091--S/R---77
0092--LBL---51
0093-- a ---13
0094-- 5 ---05
0095-- 0 ---00
0096--XFR---67
0097-- 1 ---01
0098-- 2 ---02
0099-- 0 ---00
0100--XTO---23
0101-- b ---14
0102--XFR---67
0103--IND---31
0104-- b ---14
0105--FMT---42
0106-- 4 ---04
0107-- 2 ---02
0108--XTO---23
0109--PSE---57
0110--PSE---57
0111--PSE---57
0112-- 1 ---01
0113--XTO---23
0114-- a ---13
0115--SFL---54
0116--LBL---51
0117-- D ---63
0118--FMT---42
0119-- 3 ---03
0120-- 3 ---03
0121-- . ---28
0122-- UP---27
0123--FMT---42
0124-- 4 ---04
0125-- 1 ---01
0126--FMT---42
0127-- 1 ---01
0128--FMT---42
0129-- a ---13
0130-- UP---27
0131--XFR---67
0132-- 1 ---01
0133-- 7 ---07
0134--X=Y---50
0135-- DN---25
0136--GTO---44
0137--LBL---51
0138-- M ---76
0139-- 1 ---01
0140-- 5 ---05
0141--XEY---30
0142--X>Y---53
0143--GTO---44
0144--LBL---51
0145-- E ---65
0146--CNT---47
```

Table 27 HP 9810A 741 Interference Program (cont)

```
0145--  DN---25
0146--XFR---67
0147--  1 ---01
0148--  5 ---05
0149--DIV---35
0150--  YE---24
0151--IND---31
0152--DIV---35
0153--  1 ---01
0154--  7 ---07
0155--XFR---67
0156--  0 ---00
0157--  UP---27
0158--  1 ---01
0159--  6 ---06
0160--  X ---36
0161--  6 ---06
0162--  1 ---01
0163--  + ---33
0164--YTO---40
0165--  6 ---14
0166--  DN---25
0167--YTO---40
0168--IND---31
0169--  6 ---14
0170--GTO---44
0171--LBL---51
0172--  H ---74
0173--LBL---51
0174--  F ---16
0175--  6 ---06
0176--  2 ---02
0177--XEY---30
0178--  1 ---01
0179--  6 ---06
0180--XFR---67
0181--  X ---36
0182--  0 ---00
0183--  + ---33
0184--YTO---40
0185--  1 ---01
0186--  9 ---11
0187--  DN---25
0188--  YE---24
0189--IND---31
0190--  X ---36
0191--  a ---13
0192--X<Y---52
0193--GTO---44
0194--LBL---51
0195--  F ---16
0196--CHS---40
0197--  7 ---07
0198--  1 ---01
0199--PSE---57
0200--  1 ---01
0201--XTO---23
0202--  + ---33
0203--  6 ---14
0204--XFR---67
0205--IND---31
0206--  6 ---14
0207--  UP---27
0208--INT---64
0209--  - ---34
0210--  UP---27
0211--EEX---26
0212--  7 ---07
0213--DIV---35
0214--RUP---22
0215--XEY---30
0216--XFR---67
0217--  1 ---01
0218--  8 ---10
0219--  X ---36
0220--  X ---36
0221--RUP---22
0222--XEY---30
0223--  X ---36
0224--  X ---36
0225--  X ---36
0226--  DN---25
0227--  + ---33
0228--  YE---24
0229--  + ---33
0230--  7 ---07
0231--  1 ---01
0232--  DN---25
0233--  K ---55
0234--  5 ---05
0235--  UP---27
0236--  1 ---01
0237--  5 ---05
0238--  UP---27
0239--  a ---13
0240--X<Y---52
0241--GTO---44
0242--LBL---51
0243--  F ---16
0244--CHT---47
0245--  DN---25
0246--XFR---67
0247--  1 ---01
0248--  5 ---05
0249--DIV---35
0250--  YE---24
0251--IND---31
0252--DIV---35
0253--  1 ---01
0254--  7 ---07
0255--XFR---67
0256--  0 ---00
0257--  UP---27
0258--  1 ---01
0259--  6 ---06
0260--  X ---36
0261--  6 ---06
0262--  1 ---01
0263--  + ---33
0264--YTO---40
0265--  6 ---14
0266--  DN---25
0267--YTO---40
0268--IND---31
0269--  6 ---14
0270--GTO---44
0271--LBL---51
0272--  H ---74
0273--LBL---51
0274--  F ---16
0275--  6 ---06
0276--  2 ---02
0277--XEY---30
0278--  1 ---01
0279--  6 ---06
0280--XFR---67
0281--  X ---36
0282--  0 ---00
0283--  + ---33
0284--YTO---40
0285--  1 ---01
0286--  9 ---11
0287--  DN---25
0288--  YE---24
0289--IND---31
0290--  X ---36
0291--  a ---13
0292--XFR---67
0293--  1 ---01
```

Table 27 HP 9810A 741 Interference Program (cont)

```
0294--  7 ---07
0295-- UP---27
0296-- a ---13
0297--X=Y---50
0298--RUP---22
0299--GTO---44
0300--LBL---51
0301-- G ---15
0302--RUP---22
0303--GTO---44
0304--LBL---51
0305-- N ---73
0306--LBL---51
0307-- G ---15
0308--XFR---67
0309--DIV---35
0310-- 1 ---01
0311-- 6 ---06
0312--LBL---51
0313-- N ---73
0314--XTO---23
0315--IND---31
0316-- + ---33
0317-- 1 ---01
0318-- 9 ---11
0319--LBL---51
0320-- H ---74
0321-- 1 ---01
0322-- E ---60
0323--GTO---44
0324--LBL---51
0325-- D ---63
0326--LBL---51
0327-- I ---65
0328-- 2 ---02
0329-- 9 ---11
0330--XEY---30
0331-- a ---13
0332--X>Y---53
0333--GTO---44
0334--LBL---51
0335-- K ---55
0336--CNT---47
0337--PSE---57
0338--PSE---57
0339--IFG---43
0340-- DN---25
0341--GTO---44
0342--LBL---51
0343-- 1 ---75
0344--SFL---54
0345-- DN---25
0346-- YE---24
0347--IND---31
0348-- - ---34
0349-- 1 ---01
0350-- 9 ---11
0351--LBL---51
0352-- J ---75
0353-- 1 ---01
0354--XTO---23
0355-- + ---33
0356-- 1 ---01
0357-- 9 ---11
0358--YTO---40
0359--IND---31
0360-- 1 ---01
0361-- 9 ---11
0362--GTO---44
0363--LBL---51
0364-- H ---74
0365--LBL---51
0366-- K ---55
0367--XFR---67
0368-- 5 ---05
0369-- 1 ---01
0370--FMT---42
0371-- 4 ---04
0372-- 2 ---02
0373--XTO---23
0374--FMT---42
0375-- 4 ---04
0376-- 1 ---01
0377--FMT---42
0378--SFL---54
0379--FMT---42
0380-- 1 ---01
0381-- 6 ---06
0382-- UP---27
0383--XFR---67
0384-- 0 ---00
0385-- X ---36
0386-- 6 ---06
0387-- 2 ---02
0388-- + ---33
0389--YTO---40
0390-- a ---13
0391--XFR---67
0392--IND---31
0393-- a ---13
0394--CHS---32
0395-- UP---27
0396-- 1 ---01
0397-- D ---63
0398--XFR---67
0399--IND---31
0400-- a ---13
0401-- + ---33
0402-- 1 ---40
0403--IND---31
0404-- a ---13
0405--XEY---30
0406--DIV---35
0407--FMT---42
0408--FMT---42
0409-- π ---56
0410--CLR---20
0411--INT---64
0412--FMT---42
0413--PNT---45
0414-- DN---25
0415-- K ---55
0416-- 4 ---04
0417-- UP---27
0418-- 1 ---01
0419-- 0 ---00
0420-- X ---36
0421-- 1 ---01
0422-- E ---60
0423--YTO---40
0424--IND---31
0425-- a ---13
0426-- 1 ---01
0427-- E ---60
0428--XFR---67
0429--IND---31
0430-- a ---13
0431--PNT---45
0432-- 1 ---01
0433--XTO---23
0434-- + ---33
0435-- 0 ---00
0436--XTO---23
0437-- + ---33
0438-- 2 ---02
0439-- 1 ---00
0440--XFR---67
```

Table 27 HP 9810A 741 Interference Program (cont)

```
0441--  1  ---00
0442--  UP---27
0443--  3  ---03
0444--X>Y---53
0445--GTO---44
0446--LBL---51
0447--  C  ---61
0448--CNT---47
0449--FMT---42
0450--  5  ---05
0451--EEX---26
0452--FMT---42
0453--FMT---42
0454--  0  ---13
0455--  E  ---60
0456--  C  ---61
0457--FMT---42
0458--STP---41
0459--  3  ---03
0460--  3  ---03
0461--  UP---27
0462--  7  ---07
0463--  6  ---06
0464--FMT---42
0465--  5  ---05
0466--XTO---23
0467--  2  ---02
0468--  1  ---01
0469--  UP---27
0470--XFR---67
```

```
0471-          -0
0472--  0    --00
0473--X=Y---50
0474--GTO---44
0475--LBL---51
0476--  π  ---58
0477--CNT---47
0478--GTO---44
0479--LBL---51
0480--  A  ---62
0481--LBL---51
0482--  0  ---13
0483--XFR---67
0484--  5  ---05
0485--  1  ---01
0486--FMT---42
0487--  4  ---04
0488--  2  ---02
0489--XTO---23
0490--FMT---42
0491--FMT---42
0492--  A  ---62
0493--  M  ---70
0494--  π  ---5E
0495--FMT---42
0496--STP---41
0497--S/R---77
0498--END---46
```

Table 28 Register Allocation For Revised 741 HP 9810A Program

a	CHANNEL COUNTER
b	SCRATCH AND INDIRECT
0	FREQUENCY, POWER COUNTER FOR DUMPING TO CASSETTE
1	LOSS FOR PORT 1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	INCIDENT POWER COUPLER COEFFICIENT
16	REFLECTED POWER COUPLER COEFFICIENT
17	INPUT PORT
18	LOG V
19	CAL. FACTOR ADDRESS, V & I ADDRESSES
20	POWER COUNTER FOR PIN MODULATOR
21	DETECTOR COEFFICIENTS - B_0 & B_1 - DETECTOR # 1
22	B_2 & B_3 DETECTOR 1
23	B_0 & B_1 DETECTOR 2
24	B_2 & B_3 DETECTOR 2

Table 28 (cont)

25	DETECTOR COEFFICIENTS -	B_0 & B_1 -	DETECTOR # 3
26		B_2 & B_3	3
27		B_0 & B_1	4
28		B_2 & B_3	4
29		B_0 & B_1	5
30		B_2 & B_3	5
31		B_0 & B_1	6
32		B_2 & B_3	6
33		B_0 & B_1	7
34		B_2 & B_3	7
35		B_0 & B_1	8
36		B_2 & B_3	8
37		B_0 & B_1	9
38		B_2 & B_3	9
39		B_0 & B_1	10
40		B_2 & B_3	10
41		B_0 & B_1	11
42		B_2 & B_3	11
43		B_0 & B_1	12
44		B_2 & B_3	12
45		B_0 & B_1	13
46		B_2 & B_3	13
47		B_0 & B_1	14
48		B_2 & B_3	14
49		B_0 & B_1	15

Table 28 (cont)

50	DETECTOR COEFFICIENTS - B_2 & B_3 - DETECTOR #	15
51	VOLTAGE FOR PIN MODULATOR FOR POWER STEP #	1
52		2
53		3
54		4
55		5
56		6
57		7
58		8
59		9
60		10
61		11
62		12
63		13
64		14
65		15
66		16
67		17
68		18
69		19
70		20
71	TEMPORARY STORAGE FOR CALCULATING P	
72	SPARE	
73	POWER STEP TO ADD LARGE AMPLIFIER	
74	SPARE	
75	SPARE	
76	S/N	
77	P_{IN}	
78	CAL FACTOR	
79	V_{OUT}	
80	$V_{OUT} - V'_{OUT}$	
81	V_{NI}	
82	$V_{NI} - V'_{NI}$	
83	$V_{ON\ \#2}$	
84	$V_{ON\ \#2} - V'_{ON\ \#2}$	
85	$V_{ON\ \#6}$	

Table 28 (cont)

86	$V_{ON\ \#6} - V'_{ON\ \#6}$
87	V_{CC+}
88	$V_{CC^+} - V'_{CC+}$
89	V_{CC-}
90	$V_{CC-} - V'_{CC-}$
91	V_{II}
92	$V_{II} - V'_{II}$
93	P_{IN}
94	CAL FACTOR
95	V_{OUT}
96	$V_{OUT} - V'_{OUT}$
97	V_{NI}
98	$V_{NI} - V'_{NI}$
99	$V_{ON\ \#2}$
100	$V_{ON\ \#2} - V'_{ON\ \#2}$
101	$V_{ON\ \#6}$
102	$V_{ON\ \#6} - V'_{ON\ \#6}$
103	V_{CC+}
104	$V_{CC+} - V'_{CC+}$
105	V_{CC-}
106	$V_{CC-} - V'_{CC-}$
107	V_{II}
108	$V_{II} - V'_{II}$

Table 29 HP 9830A Program to Convert from Data to Matrix Tapes for 741

```
10 COM FS[20,16],A
20 REM  REV. PROG. TO CONVERT FROM DATA TO MATRIX TAPE FOR 741
30 DIM C[37]
40 DISP "FIRST MATRIX TAPE FILE #";
50 INPUT Q
60 DISP "FIRST FILE #";
70 INPUT M
80 FOR I=0 TO 9
90 LOAD  DATA M+I,C
100 IF I>0 THEN 120
110 A=C[1]
120 IF A#C[1] THEN 630
130 FOR J=1 TO 2
140 FOR K=1 TO 16
150 IF J+2*I#1 THEN 170
160 IF K=2 THEN 190
170 F[J+2*I,K]=C[K+1+16*(J-1)]
180 GOTO 200
190 F[J+2*I,2]=0
200 NEXT K
210 NEXT J
220 NEXT I
230 R2=5000
240 FOR I=1 TO 20
250 F[I,4]=F[I,4]*2
260 F[I,6]=F[I,6]*10/9.1
270 F[I,8]=F[I,8]*1000/R2
280 F[I,10]=F[I,10]*1000/R2
290 F[I,12]=F[I,12]*100
300 F[I,14]=F[I,14]*100
310 NEXT I
320 PRINT
330 PRINT
```

Table 29 HP 9830A Program to Convert from Data to Matrix Tape for 741 (cont)

```
340 PRINT
350 PRINT
360 WRITE (15,370)A
370 FORMAT 30X,"S/N =",F7.0
380 PRINT
390 PRINT
400 FORMAT "         P(MW)    C.F.(DB)   VOUT     IOUT     VNI      INI",F4.0
410 WRITE (15,400)"    VON2      ION2     VON6"
420 FOR I=1 TO 20
430 WRITE (15,440)F[I,1],F[I,2],F[I,3],F[I,4],F[I,5],F[I,6],F[I,7],F[I,8],F[I,9]
440 FORMAT 5X,F9.4,F9.3,F8.3,F8.2,F7.2,F8.4,F8.2,F8.4,F8.2
450 NEXT I
460 PRINT
470 PRINT
480 PRINT
490 PRINT
500 FORMAT "         P(MW)      ION6     VCC+     ICC+    VCC-",F4.0
510 WRITE (15,500)"     ICC-       VII      III"
520 FOR I=1 TO 20
530 WRITE (15,550)F[I,1],F[I,10],F[I,11],F[I,12],F[I,13],F[I,14],F[I,15],F[I,16]
540 NEXT I
550 FORMAT 5X,2F9.4,F7.2,3F8.2,F9.4,F8.4
560 FOR I=1 TO 12
570 PRINT
580 NEXT I
590 STORE  DATA #5,Q
600 Q=Q+1
610 M=M+10
620 GOTO 80
630 DISP "S/N NOT ="A;C[1]
640 STOP
650 END
```

Table 30 741 Interference Data Plot Program from Matrix Tape (HP 9830A)

```
10 COM FS[20,16],A
20 REM PROGRAM TO PLOT 741 DATA FROM MATRIX TAPE
30 DISP "DATA COLUMN #";
40 INPUT Y
50 DISP "FIRST MATRIX FILE #";
60 INPUT X
70 DISP "YMIN,YMAX";
80 INPUT N,M
90 DISP "PLACE PAPER-PLATEN; CONT & EXEC"
100 STOP
110 SCALE 0,11,0,7.5
120 OFFSET 2.5,1.5
130 XAXIS 0,1.4,0,7
140 YAXIS 0,0.5,0,5
150 LABEL (*,2,3.4,PI/2,5/7)
160 FOR J=0 TO 4
170 PLOT (LGT(2)+J)*1.4,0,1
180 CPLOT 0,-0.3
190 LABEL (*)"-";
200 PLOT (LGT(5)+J)*1.4,0,1
210 CPLOT 0,-0.3
220 LABEL (*)"-";
230 NEXT J
240 FOR I=1 TO 5
250 PLOT I*1.4,0,1
260 PLOT I*1.4,5,2
270 NEXT I
280 FOR I=1 TO 10
290 PLOT 0,I*0.5,1
300 PLOT 7,I*0.5,2
310 NEXT I
320 SCALE -53/14,57/14,N-1.5*(M-N)/5,N+6*(M-N)/5
330 FOR I=-2 TO 3
340 LABEL (*,1.5,1.7,0,5/7)
350 PLOT I,N,1
360 CPLOT -2,-2
370 LABEL (410,1.5,1.7,0,5/7)10;
380 CPLOT 0,0.6
390 LABEL (420,1.125,1.7,0,5/7)I;
400 NEXT I
410 FORMAT F3.0
420 FORMAT F2.0
430 LABEL (*,1.5,1.7,0,5/7)
440 J=(M-N)/5
450 FOR I=0 TO 5
460 PLOT -2,N+J*I,1
470 CPLOT -9,-0.3
480 LABEL (500)N+J*I;
```

Table 30 741 Interference Data Plot Program from Matrix Tape (HP 9830A) (cont)

```
490 NEXT I
500 FORMAT F6.2
510 FOR K=1 TO 10
520 LOAD  DATA X
530 LABEL (*,1,0,8,0,5/7)
540 PLOT -2.07,F[1,Y],1
550 CPLOT -0.3,-0.3
560 LABEL (*)"X"
570 FOR I=2 TO 20
580 IF LGT(F[I,1])>-2 THEN 600
590 F[I,1]=0.01
600 PLOT LGT(F[I,1]),F[I,Y],1
610 CPLOT -0.3,-0.3
620 LABEL (*)"*";
630 NEXT I
640 X=X+1
650 NEXT K
660 PLOT 0.2,M-1.7*(M-N)/10,1
670 LABEL (*)A
680 GOTO 90
690 END
```

Table 31 4011 Interference Test Program (HP 9810A)

```
0000--FMT---42
0001--XFR---67
0002--XFR---67
0003-- 0 ---00
0004--PNT---45
0005--LBL---51
0006-- A ---62
0007-- 1 ---01
0008--XTO---23
0009-- 2 ---02
0010-- 0 ---00
0011--XFR---67
0012-- 5 ---05
0013-- 5 ---05
0014--FMT---42
0015-- 4 ---04
0016-- 2 ---02
0017--XTO---23
0018--FMT---42
0019--FMT---42
0020--YTO---40
0021--DIV---35
0022-- N ---73
0023--FMT---42
0024--STP---41
0025--XTO---23
0026-- 8 ---10
0027-- 6 ---06
0028--PNT---45
0029-- UP---27
0030--EEX---26
0031-- 3 ---03
0032--DIV---35
0033-- DN---25
0034-- UP---27
0035--INT---64
0036-- - ---34
0037-- 1 ---01
0038-- 0 ---00
0039-- X ---36
0040-- DN---25
0041--INT---64
0042-- UP---27
0043-- 4 ---04
0044--X=Y---50
0045-- 1 ---01
0046-- 6 ---06
0047-- UP---27
0048--CNT---47
0049--YTO---40
0050-- 1 ---01
0051-- 9 ---11
0052--LBL---51
0053-- B ---66
0054--FMT---42
0055-- 4 ---04
0056-- 1 ---01
0057--FMT---42
0058--SFL---54
0059--FMT---42
0060--PSE---57
0061--CLX---37
0062--XTO---23
0063-- 8 ---10
0064-- 9 ---11
0065--XTO---23
0066-- 1 ---01
0067-- 0 ---00
0068-- 0 ---00
0069--PSE---57
0070-- 1 ---01
0071--XTO---23
0072-- 0 ---00
0073--LBL---51
0074-- C ---61
0075--FMT---42
0076-- 4 ---04
0077-- 1 ---01
0078--FMT---42
0079-- 1 ---01
0080--FMT---42
0081--XFR---67
0082-- 7 ---07
0083-- 5 ---05
0084-- UP---27
0085--XFR---67
0086-- 2 ---02
0087-- 0 ---00
0088--X=Y---50
0089--GTO---44
0090--S/R---77
0091--LBL---51
0092-- L ---72
0093-- 5 ---05
0094-- 4 ---04
0095--XFR---67
0096-- + ---33
0097-- 2 ---02
0098-- 0 ---00
0099--XTO---23
0100-- 6 ---14
0101--XFR---67
0102--IND---31
0103-- 6 ---14
0104--FMT---42
0105-- 4 ---04
0106-- 2 ---02
0107--XTO---23
0108--PSE---57
0109--PSE---57
0110--PSE---57
0111-- 1 ---01
0112--XTO---23
0113-- A ---13
0114--LBL---51
0115-- D ---63
0116--FMT---42
0117-- 3 ---03
0118-- 3 ---03
0119-- . ---21
0120-- UP---27
0121--FMT---42
0122-- 4 ---04
0123-- 1 ---01
0124--FMT---42
0125-- 1 ---01
0126--FMT---42
0127-- A ---13
0128-- UP---27
0129--XFR---67
0130-- 1 ---01
0131-- 9 ---11
0132--X=Y---50
0133-- DN---25
0134--GTO---44
0135--LBL---51
0136-- E ---66
0137-- 1 ---01
0138-- 7 ---07
0139--XEY---30
0140--X>Y---53
0141--GTO---44
0142--LBL---51
0143-- J ---75
0144--CNT---47
0145-- DN---25
0146-- G ---15
0147--EEX---26
0148--CHS---32
0149-- 3 ---03
0150--X>Y---53
```

Table 31 4011 Interference Test Program (HP 9810A)(cont)

```
0151--CLX---37
0152--XEY---30
0153--CNT---47
0154--CNT---47
0155--LBL---51
0156-- E ---60
0157-- DN---25
0158-- K ---55
0159-- 4 ---04
0160--XTO---23
0161-- 7 ---07
0162-- 7 ---07
0163-- a ---13
0164-- UP---27
0165-- 2 ---02
0166-- X ---36
0167-- 1 ---01
0168-- 9 ---11
0169-- + ---33
0170--YTO---40
0171-- b ---14
0172--XFR---67
0173--IND---31
0174-- b ---14
0175-- UP---27
0176--INT---64
0177-- - ---34
0178-- UP---27
0179--EEX---26
0180-- 5 ---05
0181--DIV---35
0182-- DN---25
0183--XEY---30
0184-- UP---27
0185-- 1 ---01
0186-- 0 ---00
0187-- X ---36
0188--XFR---67
0189-- 7 ---07
0190-- 7 ---07
0191-- X ---36
0192-- DN---25
0193-- + ---33
0194--YTO---40
0195-- 7 ---07
0196-- 8 ---10
0197--PSE---57
0198-- 1 ---01
0199--XTO---23
0200-- + ---33
0201-- b ---14
0202--XFR---67
0203--IND---31
0204-- b ---14
0205-- UP---27
0206--INT---64
0207-- - ---34
0208-- UP---27
0209--EEX---26
0210-- 7 ---07
0211--DIV---35
0212--RUP---22
0213--XEY---30
0214--XFR---67
0215-- 7 ---07
0216-- 7 ---07
0217-- X ---36
0218-- X ---36
0219--RUP---22
0220--XEY---30
0221-- X ---36
0222-- X ---36
0223-- X ---36
0224-- DN---25
0225-- + ---33
0226-- YE---24
0227-- + ---33
0228-- 7 ---07
0229-- 8 ---10
0230-- DN---25
0231-- K ---55
0232-- 5 ---05
0233-- UP---27
0234-- 1 ---01
0235-- 7 ---07
0236-- UP---27
0237-- a ---13
0238--X<Y---52
0239--GTO---44
0240--LBL---51
0241-- F ---16
0242--CNT---47
0243-- DN---25
0244--XFR---67
0245-- 1 ---01
0246-- 7 ---07
0247--DIV---35
0248-- YE---24
0249--IND---31
0250--DIV---35
0251-- 1 ---01
0252-- 9 ---11
0253--XFR---67
0254-- 0 ---00
0255-- UP---27
0256-- 1 ---01
0257-- 1 ---01
0258-- X ---36
0259-- 7 ---07
0260-- 6 ---06
0261-- + ---33
0262--YTO---40
0263-- b ---14
0264-- DN---25
0265--YTO---40
0266--IND---31
0267-- b ---14
0268--GTO---44
0269--LBL---51
0270-- I ---65
0271--LBL---51
0272-- F ---16
0273-- 7 ---07
0274-- 8 ---10
0275--XEY---30
0276-- 1 ---01
0277-- 1 ---01
0278--XFR---67
0279-- X ---36
0280-- 0 ---00
0281-- + ---33
0282--YTO---40
0283-- 7 ---07
0284-- 6 ---06
0285-- DN---25
0286-- YE---24
0287--IND---31
0288-- X ---36
0289-- a ---13
0290--XFR---67
0291-- 1 ---01
0292-- 9 ---11
0293-- UP---27
0294-- a ---13
0295--X=Y---50
0296--RUP---22
0297--GTO---44
0298--LBL---51
0299-- G ---15
0300--RUP---22
```

Table 21 4011 Interference Test Program (HP 9810A)(cont)

```
0301--GTO---44
0302--LBL---51
0303-- H ---74
0304--LBL---51
0305-- G ---15
0306--XFR---67
0307--DIV---35
0308-- 1 ---01
0309-- 8 ---10
0310-- UP---27
0311-- 1 ---01
0312--CHS---32
0313--XFR---67
0314-- + ---33
0315-- 7 ---07
0316-- 6 ---06
0317--XTO---23
0318-- 6 ---14
0319-- DN---25
0320--XTO---23
0321--IND---31
0322-- 6 ---14
0323--LBL---51
0324-- H ---74
0325--XTO---23
0326--IND---31
0327-- + ---33
0328-- 7 ---07
0329-- 6 ---06
0330--LBL---51
0331-- I ---65
0332-- 1 ---01
0333-- E ---60
0334--GTO---44
0335--LBL---51
0336-- D ---63
0337--LBL---51
0338-- J ---75
0339-- 2 ---02
0340-- 5 ---05
0341--XEY---30
0342-- α ---13
0343--X>Y---53
0344--GTO---44
0345--LBL---51
0346-- K ---55
0347--CNT---47
0348--PSE---57
0349--PSE---57
0350-- 1 ---01
0351--XTO---23
0352-- + ---33
0353-- 7 ---07
0354-- 6 ---06
0355-- DN---25
0356--YTO---40
0357--IND---31
0358-- 7 ---07
0359-- 6 ---06
0360--GTO---44
0361--LBL---51
0362-- I ---65
0363--LBL---51
0364-- K ---55
0365--XFR---67
0366-- 5 ---05
0367-- 5 ---05
0368--FMT---42
0369-- 4 ---04
0370-- 2 ---02
0371--XTO---23
0372--FMT---42
0373-- 4 ---04
0374-- 1 ---01
0375--FMT---42
0376--SFL---54
0377--FMT---42
0378-- 1 ---01
0379-- 1 ---01
0380-- UP---27
0381--XFR---67
0382-- 0 ---00
0383-- X ---36
0384-- 7 ---07
0385-- 8 ---10
0386-- + ---33
0387--YTO---40
0388-- α ---13
0389--XFR---67
0390--IND---31
0391-- α ---13
0392--CHS---32
0393-- UP---27
0394-- 2 ---02
0395-- D ---63
0396--XFR---67
0397--IND---31
0398-- α ---13
0399-- + ---33
0400--YTO---40
0401--IND---31
0402-- α ---13
0403--XEY---30
0404--DIV---35
0405--FMT---42
0406--FMT---42
0407-- π ---56
0408--CLX---37
0409--INT---64
0410--FMT---42
0411--PNT---45
0412-- DN---25
0413-- K ---55
0414-- 4 ---04
0415-- UP---27
0416-- 1 ---01
0417-- 0 ---00
0418-- X ---36
0419-- 2 ---02
0420-- E ---60
0421--YTO---40
0422--IND---31
0423-- α ---13
0424-- 4 ---04
0425-- E ---60
0426--XFR---67
0427--IND---31
0428-- α ---13
0429--PNT---45
0430-- 1 ---01
0431--XTO---23
0432-- + ---33
0433-- 0 ---00
0434--XTO---23
0435-- + ---33
0436-- 2 ---02
0437-- 0 ---00
0438--XFR---67
0439-- 0 ---00
0440-- UP---27
0441-- 3 ---03
0442--X>Y---53
0443--GTO---44
0444--LBL---51
0445-- C ---61
0446--CNT---47
0447--FNT---42
0448-- 5 ---05
0449--EEX---26
0450--FMT---42
```

Table 31 4011 Interference Test Program (HP 9810A)(cont)

```
0451--FMT---42
0452-- α ---13
0453-- E ---60
0454-- C ---61
0455--IFG---43
0456--FMT---42
0457--STP---41
0458-- 2 ---02
0459-- 3 ---03
0460-- UP---27
0461-- 8 ---10
0462-- 6 ---06
0463--FMT---42
0464-- 5 ---05
0465--XTO---23
0466-- 2 ---02
0467-- 1 ---01
0468-- UP---27
0469--XFR---67
0470-- 2 ---02
0471-- 0 ---00
0472--X=Y---50
0473--GTO---44
0474--LBL---51
0475-- A ---62
0476--CNT---47
0477--GTO---44
0478--LBL---51
0479-- B ---66
0480--LBL---51
0481-- L ---72
0482--XFR---67
0483-- 5 ---05
0484-- 5 ---05
0485--FMT---42
0486-- 4 ---04
0487-- 2 ---02
0488--XTO---23
0489--FMT---42
0490--FMT---42
0491-- A ---62
0492-- M ---70
0493-- π ---56
0494--FMT---42
0495--STP---41
0496--S/R---77
0497--END---46
```

Table 32 4011 Interference Test Program Register Allocations

a	CHANNEL COUNTER
b	SCRATCH & INDIRECT
0	FREQUENCY (GHz), COUNTER FOR DUMPING TO CASSETTE
1	LOSS FOR PORT 1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	INCIDENT POWER COUPLER COEFFICIENT
18	REFLECTED POWER COUPLER COEFFICIENT
19	INPUT PORT
20	POWER COUNTER FOR PIN MODULATOR
21	DETECTOR COEFFICIENTS - B_0 & B_1 - DETECTOR # 1
22	B_2 & B_3 1
23	B_0 & B_1 2
24	B_2 & B_3 2

Table 32 (cont)

25	DETECTOR COEFFICIENTS -	B_0 & B_1 - DETECTOR #	3
26		B_2 & B_3	3
27		B_0 & B_1	4
28		B_2 & B_3	4
29		B_0 & B_1	5
30		B_2 & B_3	5
31		B_0 & B_1	6
32		B_2 & B_3	6
33		B_0 & B_1	7
34		B_2 & B_3	7
35		B_0 & B_1	8
36		B_2 & B_3	8
37		B_0 & B_1	9
38		B_2 & B_3	9
39		B_0 & B_1	10
40		B_2 & B_3	10
41		B_0 & B_1	11
42		B_2 & B_3	11
43		B_0 & B_1	12
44		B_2 & B_3	12
45		B_0 & B_1	13
46		B_2 & B_3	13
47		B_0 & B_1	14
48		B_2 & B_3	14
49		B_0 & B_1	15
50		B_2 & B_3	15

Table 32 (cont)

51	DETECTOR COEFFICIENTS - B_0 & B_1 - DETECTOR #	16
52	B_2 & B_3	16
53	B_0 & B_1	17
54	B_2 & B_3	17
55	VOLTAGE FOR PIN MODULATOR STEP #	1 (No RF)
56		2
57		3
58		4
59		5
60		6
61		7
62		8
63		9
64		10
65		11
66		12
67		13
68		14
69		15
70		16
71		17
72		18
73		19
74		20
75	POWER STEP TO ADD LARGE AMPLIFIER	
76	CAL. FACTOR ADDRESS, V ADDRESSES	
77	LOG V	

Table 32 (cont)

78	TEMPORARY STORAGE FOR CALCULATING P
79	BIAS UNIT REFLECTION LOSS COEFFICIENT
80	SPARE
81	SPARE
82	SPARE
83	SPARE
84	SPARE
85	SPARE
86	S/H
87	P_{DISS}
88	P_{REF}
89	CAL. FACTOR
90	V_{DD}
91	V'_{DD}
92	V'_{OUT}
93	V_{OUT}
94	V_{SS}
95	V'_{IN}
96	V_{IN2}
97	V_{IN1}
98	P_{DISS}
99	P_{REF}
100	CAL. FACTOR
101	V_{DD}
102	V'_{DD}
103	V'_{OUT}

Table 32 (cont)

104	V_{OUT}
105	V_{SS}
106	V'_{IN}
107	V_{IN2}
108	V_{IN1}

Table 33 4011 Data Tape to Matrix Tape Conversion Program (HP 9830A)

```
10 COM FS[23,11],A
20 DIM C[23]
30 MAT F=ZER
40 DISP "FIRST FILE #, # OF FILES";
50 INPUT M,N
60 DISP "FIRST MATRIX FILE #";
70 INPUT Q
80 FOR I=0 TO N-1
90 LOAD  DATA M+I,C
100 IF I>0 THEN 120
110 A=C[1]
120 IF A#C[1] THEN 480
130 FOR J=1 TO 2
140 FOR K=1 TO 11
150 IF C[K+1+9*(J-1)]<-1E+60 THEN 170
160 F[J+2*I,K]=C[K+1+11*(J-1)]
170 NEXT K
180 NEXT J
190 NEXT I
200 FOR I=1 TO 20
210 F[I,5]=(F[I,5]-F[I,4])*100
220 F[I,8]=(F[I,8])*(-100)
230 F[I,6]=F[I,6]-F[I,7]
240 F[I,9]=(F[I,9]-F[I,10])*2.5
250 NEXT I
260 PRINT
270 PRINT
280 PRINT
290 WRITE (15,300)A
300 FORMAT 30X,"S/N=",F7.0
310 PRINT
320 PRINT
330 FORMAT "   PD(MW) PR(MW) CF(DB) VDD   IDD    IOUT  VOUT   ISS "
```

Table 33 4011 Data Tape to Matrix Tape Conversion Program (HP 9830A)(cont)

```
340 WRITE (15,330)"  IINRF   VIN2    VIN1"
350 FOR I=1 TO 20
360 WRITE (15,450)F[I,1],F[I,2],F[I,3],F[I,4],F[I,5],F[I,6],F[I,7],F[I,8],
370 WRITE (15,460)F[I,9],F[I,10],F[I,11]
380 NEXT I
390 PRINT
400 PRINT
410 PRINT
420 PRINT
430 PRINT
440 PRINT
450 FORMAT F9.3,F8.3,F6.2,2F6.3,F7.3,F6.3,F6.2
460 FORMAT 3F7.3
470 GOTO 500
480 DISP "S/N NOT ="A;C[1]
490 STOP
500 DISP "CHANGE TO MATRIX TAPE";
510 STOP
520 STORE  DATA Q
530 M=M+10
540 Q=Q+1
550 DISP "CHANGE TO DATA TAPE";
560 STOP
570 GOTO 80
```

Table 34 General Plot Program from Matrix Tape For 4011

```
10 COM FS[23,11],A
20 MAT F=ZER
30 DISP "FOR PLOT,WRITE COL# & PRESS EXEC";
40 INPUT K
50 DISP "FIRST MATRIX FILE NO.";
60 INPUT Q
70 SCALE 0,8.5,0,10
80 OFFSET 2,1.5
90 XAXIS 0,1.5,0,6
100 YAXIS 0,0.7,0,7
110 FOR J=0 TO 3
120 PLOT (LGT(2)+J)*1.5,0,1
130 LABEL (*,1,3.4,PI/2,7/6)
140 CPLOT 0,-0.3
150 LABEL (*)"-";
160 PLOT (LGT(5)+J)*1.5,0,1
170 CPLOT 0,-0.3
180 LABEL (*)"-";
190 NEXT J
200 DISP "YMIN,YMAX";
210 INPUT N,M
220 SCALE -7/3,10/3,N-1.5*(M-N)/7,N+8.5*(M-N)/7
230 FOR I=-1 TO 3
240 LABEL (*,1.5,1.7,0,7/6)
250 PLOT I,N,1
260 CPLOT -2,-2
270 LABEL (310,1.5,1.7,0,7/6)10;
280 CPLOT 0,0.6
290 LABEL (320,1.125,1.7,0,7/6)I;
300 NEXT I
310 FORMAT F3.0
320 FORMAT F2.0
330 LABEL (*,1.5,1.7,0,7/6)
340 A=(M-N)/5
350 FOR I=0 TO 5
360 PLOT -1,N+A*I,1
370 CPLOT -7,-0.3
380 LABEL (400)N+A*I;
390 NEXT I
400 FORMAT F7.3
410 LABEL (*,1,0.8,0,7/6)
420 FOR G=Q TO Q+4
430 LOAD  DATA G
440 FOR I=1 TO 20
450 F[1,1]=0.1
460 PLOT LGT(F[I,1]),ABS(F[I,K]),1
470 CPLOT  0.3,-0.3
```

Table 34 General Plot Program from Matrix Tape for 4011 (cont)

```
480 LABEL (*)"*"
490 IPLOT 0,0,1
500 NEXT I
510 NEXT G
520 PEN
530 SCALE 0,8.5,0,10
540 OFFSET 2,1.5
550 FOR I=1 TO 4
560 PLOT I*1.5,0,1
570 PLOT I*1.5,7,2
580 NEXT I
590 FOR I=1 TO 10
600 PLOT 0,I*0.7,1
610 PLOT 6,I*0.7,2
620 NEXT I
630 PEN
640 GOTO 30
```

Table 35 2002 Hybrid Interference Test Program (HP 9810A)

```
0000--CLR---20
0001--  F ---55
0002--CLX---37
0003--FMT---42
0004--XFR---67
0005--XFR---67
0006--  0 ---00
0007--PNT---45
0008--LBL---51
0009--  A ---62
0010--CNT---47
0011--  1 ---01
0012--  6 ---06
0013--XTO---23
0014--  2 ---02
0015--  0 ---00
0016--CNT---47
0017--  1 ---01
0018--XTO---23
0019--  0 ---00
0020--FMT---42
0021--FMT---42
0022--  I ---65
0023--  N ---73
0024--  π ---56
0025--1/X---17
0026--XTO---23
0027--CNT---47
0028--  π ---56
0029--  0 ---71
0030--  α ---13
0031--XTO---23
0032--FNT---42
0033--STP---41
0034--XTO---23
0035--  1 ---01
0036--  9 ---11
0037--PNT---45
0038--FMT---42
0039--FMT---42
0040--YTO---40
0041--DIV---35
0042--  N ---73
0043--FMT---42
0044--STP---41
0045--XTO---23
0046--  7 ---07
0047--  3 ---03
0048--PNT---45
0049--LBL---51
0050--  B ---66
0051--FMT---42
0052--  4 ---04
0053--  1 ---01
0054--FMT---42
0055--SFL---54
0056--FMT---42
0057--CNT---47
0058--FMT---42
0059--FMT---42
0060--YTO---40
0061--  E ---60
0062--XTO---23
0063--CNT---47
0064--  π ---56
0065--  0 ---71
0066--IND---31
0067--  E ---60
0068--  α ---13
0069--FMT---42
0070--CNT---47
0071--STP---41
0072--CLX---37
0073--XTO---23
0074--  7 ---07
0075--  5 ---05
0076--PSE---57
0077--FMT---42
0078--  4 ---04
0079--  1 ---01
0080--FMT---42
0081--  1 ---01
0082--FMT---42
0083--PSE---57
0084--PSE---57
0085--PSE---57
0086--  1 ---01
0087--XTO---23
0088--  α ---13
0089--LBL---51
0090--  D ---63
0091--FMT---42
0092--  3 ---03
0093--  3 ---03
0094--  . ---21
0095--  UP---27
0096--FMT---42
0097--  4 ---04
0098--  1 ---01
0099--FMT---42
0100--  1 ---01
0101--FMT---42
0102--  α ---13
0103--  UP---27
0104--XFR---67
0105--  1 ---01
0106--  9 ---11
0107--X=Y---50
0108--  DN---25
0109--GTO---44
0110--LBL---51
0111--  E ---60
0112--  1 ---01
0113--  7 ---07
0114--XEY---30
0115--X>Y---53
0116--GTO---44
0117--LBL---51
0118--  J ---75
0119--CNT---47
0120--  DN---25
0121--  G ---15
0122--EEX---26
0123--CHS---32
0124--  3 ---03
0125--X>Y---53
0126--CLX---37
0127--XEY---30
0128--CNT---47
0129--CNT---47
0130--LBL---51
0131--  E ---60
0132--  DN---25
0133--  K ---55
0134--  4 ---04
0135--XTO---23
0136--  5 ---05
0137--  7 ---07
0138--  α ---13
0139--  UP---27
0140--  2 ---02
0141--  X ---36
0142--  1 ---01
0143--  9 ---11
0144--  + ---33
0145--YTO---40
0146--  b ---14
0147--XFR---67
0148--IND---31
0149--  b ---14
0150--  UP---27
```

Table 35 2002 Hybrid Interference Test Program (HP 9810A)(cont)

```
0151--INT---64
0152--  -  ---34
0153-- UP---27
0154--EEX---26
0155-- 5 ---05
0156--DIV---35
0157-- DN---25
0158--XEY---30
0159-- UP---27
0160-- 1 ---01
0161-- 0 ---00
0162-- X ---36
0163--XFR---67
0164-- 5 ---05
0165-- 7 ---07
0166-- X ---36
0167-- DN---25
0168-- + ---33
0169--YTO---40
0170-- 5 ---05
0171-- 8 ---10
0172--PSE---57
0173-- 1 ---01
0174--XTO---23
0175-- + ---33
0176-- b ---14
0177--XFR---67
0178--IND---31
0179-- b ---14
0180-- UP---27
0181--INT---64
0182--  -  ---34
0183-- UP---27
0184--EEX---26
0185-- 7 ---07
0186--DIV---35
0187--RUP---22
0188--XEY---30
0189--XFR---67
0190-- 5 ---05
0191-- 7 ---07
0192-- X ---36
0193-- X ---36
0194--RUP---22
0195--XEY---30
0196-- X ---36
0197-- X ---36
0198-- X ---36
0199-- DN---25
0200-- + ---33
0201-- YE---24
0202-- + ---33
0203-- 5 ---05
0204-- 8 ---10
0205-- DN---25
0206-- K ---55
0207-- 5 ---05
0208-- UP---27
0209-- 1 ---01
0210-- 7 ---07
0211-- UP---27
0212-- a ---13
0213--X<Y---52
0214--GTO---44
0215--LBL---51
0216-- F ---16
0217--CNT---47
0218-- DN---25
0219--XFR---67
0220-- 1 ---01
0221-- 7 ---07
0222--DIV---35
0223-- YE---24
0224--IND---31
0225--DIV---35
0226-- 1 ---01
0227-- 9 ---11
0228--YTO---40
0229-- 9 ---11
0230-- 2 ---02
0231--GTO---44
0232--LBL---51
0233-- I ---65
0234--LBL---51
0235-- F ---16
0236-- DN---25
0237-- YE---24
0238--IND---31
0239-- X ---36
0240-- a ---13
0241--XFR---67
0242-- 1 ---01
0243-- 9 ---11
0244-- UP---27
0245-- a ---13
0246--X=Y---50
0247--RUP---22
0248--GTO---44
0249--LBL---51
0250-- G ---15
0251--RUP---22
0252--GTO---44
0253--LBL---51
0254-- H ---74
0255--LBL---51
0256-- G ---15
0257--XFR---67
0258--DIV---35
0259-- 1 ---01
0260-- 8 ---10
0261--LBL---51
0262-- H ---74
0263-- UP---27
0264-- 7 ---07
0265-- 5 ---05
0266--XFR---67
0267-- + ---33
0268-- a ---13
0269--XTO---23
0270-- b ---14
0271--YTO---40
0272--IND---31
0273-- b ---14
0274--YTO---40
0275-- + ---33
0276-- 7 ---07
0277-- 5 ---05
0278--LBL---51
0279-- I ---65
0280-- 1 ---01
0281-- E ---60
0282--GTO---44
0283--LBL---51
0284-- D ---63
0285--LBL---51
0286-- J ---75
0287-- 1 ---01
0288-- 7 ---07
0289--XFR---67
0290-- + ---33
0291-- 2 ---02
0292-- 0 ---00
0293--XEY---30
0294-- a ---13
0295--X>Y---52
0296--GTO---44
0297--LBL---51
0298-- K ---55
0299--CNT---47
0300--PSE---57
```

Table 35 2002 Hybrid Interference Test Program (HP 9810A)(cont)

```
0301--PSE---57
0302-- 7 ---07
0303-- 5 ---05
0304--XEY---30
0305-- a ---13
0306-- + ---33
0307--YTO---40
0308-- b ---14
0309-- DN---25
0310--YTO---40
0311--IND---31
0312-- b ---14
0313--GTO---44
0314--LBL---51
0315-- I ---65
0316--LBL---51
0317-- K ---55
0318--FMT---42
0319-- 4 ---04
0320-- 1 ---01
0321--FMT---42
0322--SFL---54
0323--FMT---42
0324--XFR---67
0325-- 9 ---11
0326-- 3 ---03
0327-- UP---27
0328--XFR---67
0329-- 9 ---11
0330-- 4 ---04
0331-- - ---34
0332-- 2 ---02
0333-- 0 ---00
0334-- X ---36
0335--YTO---40
0336-- 9 ---11
0337-- 4 ---04
0338--XFR---67
0339-- 9 ---11
0340-- 5 ---05
0341-- UP---27
0342--XFR---67
0343-- 9 ---11
0344-- 6 ---06
0345-- - ---34
0346-- 1 ---01
0347-- 0 ---00
0348-- 0 ---00
0349-- X ---36
0350--YTO---40
0351-- 9 ---11
0352-- 6 ---06
0353--CNT---47
0354-- 9 ---11
0355-- 7 ---07
0356--XTO---23
0357-- a ---13
0358--LBL---51
0359-- L ---72
0360--XFR---67
0361--IND---31
0362-- a ---13
0363-- UP---27
0364-- 1 ---01
0365-- E ---60
0366--XFR---67
0367--IND---31
0368-- a ---13
0369--CNT---47
0370-- - ---34
0371-- 1 ---01
0372-- 0 ---00
0373-- X ---36
0374--YTO---40
0375--IND---31
0376-- a ---13
0377-- 1 ---01
0378-- E ---60
0379-- 1 ---01
0380-- 0 ---00
0381-- 5 ---05
0382-- UP---27
0383-- a ---13
0384--X<Y---52
0385--GTO---44
0386--LBL---51
0387-- L ---72
0388--CNT---47
0389--CNT---47
0390--XFR---67
0391--IND---31
0392-- a ---13
0393-- UP---27
0394-- 1 ---01
0395-- E ---60
0396--XFR---67
0397--IND---31
0398-- a ---13
0399--CNT---47
0400-- - ---34
0401--EEX---26
0402-- 3 ---03
0403-- X ---36
0404--YTO---40
0405--IND---31
0406-- a ---13
0407-- 1 ---01
0408-- E ---60
0409-- YE---24
0410--IND---31
0411-- a ---13
0412--EEX---26
0413-- 3 ---03
0414-- X ---36
0415--YTO---40
0416--IND---31
0417-- a ---13
0418-- 1 ---01
0419-- E ---60
0420-- YE---24
0421--IND---31
0422-- a ---13
0423--EEX---26
0424-- 3 ---03
0425-- X ---36
0426--YTO---40
0427--IND---31
0428-- a ---13
0429--XFR---67
0430-- 7 ---07
0431-- 5 ---05
0432--CHS---32
0433-- UP---27
0434--XFR---67
0435-- 9 ---11
0436-- 2 ---02
0437-- + ---33
0438--YTO---40
0439-- 7 ---07
0440-- 4 ---04
0441--XEY---30
0442--DIV---35
0443--FMT---42
0444--FMT---42
0445-- π ---56
0446--CLX---37
0447--INT---64
0448--FMT---42
0449--PNT---45
0450-- DN---25
```

Table 35 2002 Hybrid Interference Test Program (HP 9810A)(cont)

```
0451--  K  ---55
0452--  4  ---04
0453--  UP---27
0454--  1  ---01
0455--  0  ---00
0456--  X  ---36
0457--YTO---40
0458--  7  ---07
0459--  5  ---05
0460--XFR---67
0461--  9  ---11
0462--  3  ---03
0463--PNT---45
0464--XFR---67
0465--  1  ---01
0466--  0  ---00
0467--  6  ---06
0468--  UP---27
0469--FMT---42
0470--  5  ---05
0471--EEX---26
0472--FMT---42
0473--FMT---42
0474--  a  ---13
0475--  E  ---60
0476--  C  ---61
0477--  n  ---71
0478--  a  ---13
0479--  D  ---63
```

```
0480--  [illegible]---47
0481--  [illegible]IT---42
0482--  [illegible]iP---41
0483--  3  ---03
0484--  6  ---06
0485--  UP---27
0486--  7  ---07
0487--  3  ---03
0488--FMT---42
0489--  5  ---05
0490--XTO---23
0491--  1  ---01
0492--XTO---23
0493--  +  ---33
0494--  0  ---00
0495--XFR---67
0496--  0  ---00
0497--  UP---27
0498--  9  ---11
0499--X>Y---53
0500--GTO---44
0501--LBL---51
0502--  B  ---66
0503--CNT---47
0504--GTO---44
0505--LBL---51
0506--  A  ---62
0507--STP---41
0508--END---46
```

Table 36 General Device and 2002 Interference Test Register Allocations

a	CHANNEL COUNTER	
b	SCRATCH AND INDIRECT	
0	FREQUENCY (GHz), INTERFERENCE LEVEL COUNTER	
1	LOSS FOR PORT	1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10
11		11
12		12
13		13
14		14
15		15
16		16
17	INCIDENT POWER COUPLER COEFFICIENT	
18	REFLECTED POWER COUPLER COEFFICIENT	
19	INPUT PORT	
20	NUMBER OF DC PARAMETERS TO BE MONITORED	
21	DETECTOR COEFFICIENTS - B_0 & B_1 - DETECTOR #	1
22	B_2 & B_3	1
23	B_0 & B_1	2

Table 36 (cont)

24	DETECTOR COEFFICIENTS -	B_2 & B_3 - DETECTOR #	2
25		B_0 & B_1	3
26		B_2 & B_3	3
27		B_0 & B_1	4
28		B_2 & B_3	4
29		B_0 & B_1	5
30		B_2 & B_3	5
31		B_0 & B_1	6
32		B_2 & B_3	6
33		B_0 & B_1	7
34		B_2 & B_3	7
35		B_0 & B_1	8
36		B_2 & B_3	8
37		B_0 & B_1	9
38		B_2 & B_3	9
39		B_0 & B_1	10
40		B_2 & B_3	10
41		B_0 & B_1	11
42		B_2 & B_3	11
43		B_0 & B_1	12
44		B_2 & B_3	12
45		B_0 & B_1	13
46		B_2 & B_3	13
47		B_0 & B_1	14
48		B_2 & B_3	14
49		B_0 & B_1	15

Table 36 (cont)

50	DETECTOR COEFFICIENTS - B_2 & B_3 - DETECTOR #	15
51	B_0 & B_1	16
52	B_2 & B_3	16
53	B_0 & B_1	17
54	B_2 & B_3	17
55	LOSS WITH OLD HP BIAS UNIT AND FIXTURE	
56	SPARE	
57	LOG V	
58	TEMPORARY STORAGE FOR CALCULATING P	
59	SPARE	
60	SPARE	
61	SPARE	
62	SPARE	
63	SPARE	
64	SPARE	
65	SPARE	
66	SPARE	
67	SPARE	
68	SPARE	
69	SPARE	
70	SPARE	
71	SPARE	
72	SPARE	
73	S/N	
74	P_{DISS}	
75	CAL. FACTOR	

Table 36 (cont)

76	P_1
77	P_2
78	P_3
79	P_4
80	P_5
81	P_6
82	P_7
83	P_8
84	P_9
85	P_{10}
86	P_{11}
87	P_{12}
88	P_{13}
89	P_{14}
90	P_{15}
91	P_{16}
92	P_{INC}
93	$V_{OUT\ 1}$ (VOLTAGE MONITORED ON PRINTER) (V_{COLL} - 2002)
94	$I_{OUT\ 1}$ (I_{COLL} - 2002)
95	$V_{OUT\ 2}$ (V_{BASE} - 2002)
96	$I_{OUT\ 2}$ (NOTHING - 2002)
97	$V_{IN\ 1}$ ($V_{IN\ 9}$ - 2002)
98	$I_{IN\ 1}$ ($I_{IN\ 1\ +\ 2}$)
99	$V_{IN\ 2}$ ($V_{IN\ 1\ +\ 2}$)
100	$I_{IN\ 2}$ ($I_{IN\ 1\ +\ 2}$)
101	$V_{IN\ 3}$

Table 36 (cont)

102	$I_{IN\ 3}$
103	$V_{IN\ 4}$
104	$I_{IN\ 4}$
105	V_{CC}
106	I_{CC}
107	I_{GND}
108	SPARE (I_{EMIT} ON 2002)

Table 37 2002 Hybrid Data Reduction Program (HP 9830A)

```
10 DIM A[8,36],C[36]
20 DISP "FILE #";
30 INPUT M
40 FOR K=0 TO 7
50 I=0
60 LOAD  DATA M+K,C
70 IF K#0 THEN 110
80 C[3]=0
90 S=C[1]
100 I=1
110 IF K#1 THEN 130
120 I=7
130 IF S#C[1] THEN 650
140 IF S#C[1] THEN 650
150 FOR J=1 TO 36
160 A[K+I,J]=C[J]
170 NEXT J
180 NEXT K
190 FOR J=1 TO 8
200 PRINT
210 NEXT J
220 WRITE (15,230)S
230 FORMAT 35X,"S/N =",F5.0
240 PRINT
250 FORMAT 4F13.4,F1.1
260 FOR I=0 TO 4 STEP 4
270 FORMAT F3.0,"RF LEVEL  ",F3.0,"RF LEVEL  ",F3.0,"RF LEVEL  ",F3.0,"RF LEVEL"
280 WRITE (15,270)"      PARAMETER ",I+0,I+1,I+2,I+3
290 PRINT
300 WRITE (15,250)"      P INC.  ",A[I+1,20],A[I+2,20],A[I+3,20],A[I+4,20]
310 WRITE (15,250)"      P DIS.  ",A[I+1,2],A[I+2,2],A[I+3,2],A[I+4,2]
320 WRITE (15,250)"      C.F.    ",A[I+1,3],A[I+2,3],A[I+3,3],A[I+4,3]
330 PRINT
```

Table 37 2002 Hybrid Data Reduction Program (cont)

```
340 GOTO 410
350 FOR K=1 TO 16
360 FORMAT F5.0,1X,4F13.4,F1.1
370 WRITE (15,360)"      P",K,A[1,K+3],A[2,K+3],A[3,K+3],A[4,K+3]
380 NEXT K
390 WRITE (15,250)"      P INC. ",A[1,20],A[2,20],A[3,20],A[4,20]
400 PRINT
410 WRITE (15,250)"      V COLL ",A[I+1,21],A[I+2,21],A[I+3,21],A[I+4,21]
420 WRITE (15,250)"      I COLL ",A[I+1,22],A[I+2,22],A[I+3,22],A[I+4,22]
430 WRITE (15,250)"      V BASE ",A[I+1,23],A[I+2,23],A[I+3,23],A[I+4,23]
440 WRITE (15,250)"      V IN 9 ",A[I+1,25],A[I+2,25],A[I+3,25],A[I+4,25]
450 WRITE (15,250)"      I IN 9 ",A[I+1,26],A[I+2,26],A[I+3,26],A[I+4,26]
460 WRITE (15,250)"      V IN1&2",A[I+1,27],A[I+2,27],A[I+3,27],A[I+4,27]
470 WRITE (15,250)"      I IN1&2",A[I+1,28],A[I+2,28],A[I+3,28],A[I+4,28]
480 WRITE (15,250)"      V IN 3 ",A[I+1,29],A[I+2,29],A[I+3,29],A[I+4,29]
490 WRITE (15,250)"      I IN 3 ",A[I+1,30],A[I+2,30],A[I+3,30],A[I+4,30]
500 WRITE (15,250)"      V IN 4 ",A[I+1,31],A[I+2,31],A[I+3,31],A[I+4,31]
510 WRITE (15,250)"      I IN 4 ",A[I+1,32],A[I+2,32],A[I+3,32],A[I+4,32]
520 WRITE (15,250)"      V CC   ",A[I+1,33],A[I+2,33],A[I+3,33],A[I+4,33]
530 WRITE (15,250)"      I CC   ",A[I+1,34],A[I+2,34],A[I+3,34],A[I+4,34]
540 WRITE (15,250)"      I GND  ",A[I+1,35],A[I+2,35],A[I+3,35],A[I+4,35]
550 WRITE (15,250)"      I EMIT ",A[I+1,36],A[I+2,36],A[I+3,36],A[I+4,36]
560 FOR K=1 TO 4
570 PRINT
580 NEXT K
590 NEXT I
600 FOR K=1 TO 8
610 PRINT
620 NEXT K
630 M=M+8
640 GOTO 40
650 DISP "S/N NOT =";S;C[1]
660 STOP
670 END
```

Table 38 Extra Digital Device Interference Test Program (HP 9810A)

```
0000--CLR---20
0001-- K ---55
0002--CLX---37
0003--FMT---42
0004--XFR---67
0005--XFR---67
0006-- 0 ---00
0007--PNT---45
0008--LBL---51
0009-- A ---62
0010--CNT---47
0011--CNT---47
0012--CNT---47
0013--CNT---47
0014--CNT---47
0015--CNT---47
0016--CNT---47
0017--CNT---47
0018--CNT---47
0019--CNT---47
0020--CNT---47
0021--CNT---47
0022--CNT---47
0023--CNT---47
0024--CNT---47
0025--CNT---47
0026--CNT---47
0027-- 1 ---01
0028-- 6 ---06
0029--XTO---23
0030-- 2 ---02
0031-- 0 ---00
0032--CNT---47
0033-- 1 ---01
0034--XTO---23
0035-- 0 ---00
0036--FMT---42
0037--FMT---42
0038-- I ---65
0039-- N ---73
0040-- π ---56
0041--1/X---17
0042--XTO---23
0043--CNT---47
0044-- π ---56
0045-- 0 ---71
0046-- α ---13
0047--XTO---23
0048--FMT---42
0049--STP---41
0050--XTO---23
0051-- ! ---01
0052-- " ---11
0053--PNT---45
0054--FMT---42
0055--FMT---42
0056--YTO---40
0057--DIV---35
0058-- N ---73
0059--FMT---42
0060--STP---41
0061--XTO---23
0062-- 7 ---07
0063-- 3 ---03
0064--PNT---45
0065--LBL---51
0066-- B ---66
0067--FMT---42
0068-- 4 ---04
0069-- 1 ---01
0070--FMT---42
0071--SFL---54
0072--FMT---42
0073--CNT---47
0074--FMT---42
0075--FMT---42
0076--YTO---40
0077-- E ---60
0078--XTO---23
0079--CNT---47
0080-- π ---56
0081-- 0 ---71
0082--IND---31
0083-- E ---60
0084-- α ---13
0085--FMT---42
0086--CNT---47
0087--STP---41
0088--CLX---37
0089--XTO---23
0090-- 7 ---07
0091-- 5 ---05
0092--PSE---57
0093--FMT---42
0094-- 4 ---04
0095-- 1 ---01
0096--FMT---42
0097-- 1 ---01
0098--FMT---42
0099--PSE---57
0100--PSE---57
0101--PSE---57
0102-- ! ---01
0103--XTO---23
0104-- α ---13
0105--LBL---51
0106-- D ---63
0107--FMT---42
0108-- 3 ---03
0109-- 3 ---03
0110-- . ---21
0111-- UP---27
0112--FMT---42
0113-- 4 ---04
0114-- 1 ---01
0115--FMT---42
0116-- 1 ---01
0117--FMT---42
0118-- α ---13
0119-- UP---27
0120--XFR---67
0121-- 1 ---01
0122-- 9 ---11
0123--X=Y---50
0124-- DN---25
0125--GTO---44
0126--LBL---51
0127-- E ---60
0128-- 1 ---01
0129-- 7 ---07
0130--XEY---30
0131--X>Y---53
0132--GTO---44
0133--LBL---51
0134-- J ---75
0135--CNT---47
0136-- DN---25
0137-- G ---15
0138--EEX---26
0139--CHS---32
0140-- 3 ---03
0141--X>Y---53
0142--CLX---37
0143--XEY---30
0144--CNT---47
0145--CNT---47
0146--LBL---51
0147-- E ---60
0148-- DN---25
0149-- K ---55
0150-- 4 ---04
```

Table 38 Extra Digital Device Interference Test Program (HP 9810A)(cont)

```
0151--XTO---23
0152-- 5 ---05
0153-- 7 ---07
0154-- a ---13
0155-- UP---27
0156-- 2 ---02
0157-- X ---36
0158-- 1 ---01
0159-- 9 ---11
0160-- + ---33
0161--YTO---40
0162-- b ---14
0163--XFR---67
0164--IND---31
0165-- b ---14
0166-- UP---27
0167--INT---64
0168-- - ---34
0169-- UP---27
0170--EEX---26
0171-- 5 ---05
0172--DIV---35
0173-- DN---25
0174--XEY---30
0175-- UP---27
0176-- 1 ---01
0177-- 0 ---00
0178-- X ---36
0179--XFR---67
0180-- 5 ---05
0181-- 7 ---07
0182-- X ---36
0183-- DN---25
0184-- + ---33
0185--YTO---40
0186-- 5 ---05
0187-- 8 ---10
0188--PSE---57
0189-- 1 ---01
0190--XTO---23
0191-- + ---33
0192-- b ---14
0193--XFR---67
0194--IND---31
0195-- b ---14
0196-- UP---27
0197--INT---64
0198-- - ---34
0199-- UP---27
0200--EEX---26
```

```
0201-- 7 ---07
0202--DIV---35
0203--RUP---22
0204--XEY---30
0205--XFR---67
0206-- 5 ---05
0207-- 7 ---07
0208-- X ---36
0209-- X ---36
0210--RUP---22
0211--XEY---30
0212-- X ---36
0213-- X ---36
0214-- X ---36
0215-- DN---25
0216-- + ---33
0217-- YE---24
0218-- + ---33
0219-- 5 ---05
0220-- 8 ---10
0221-- DN---25
0222-- K ---55
0223-- 5 ---05
0224-- UP---27
0225-- 1 ---01
0226-- 7 ---07
0227-- UP---27
0228-- a ---13
0229--X<Y---52
0230--GTO---44
0231--LBL---51
0232-- F ---16
0233--CNT---47
0234-- DN---25
0235--XFR---67
0236-- 1 ---01
0237-- 7 ---07
0238--DIV---35
0239-- YE---24
0240--IND---31
0241--DIV---35
0242-- 1 ---01
0243-- 9 ---11
0244--YTO---40
0245-- 9 ---11
0246-- 2 ---02
0247--GTO---44
0248--LBL---51
0249-- I ---65
0250--LBL---51
```

```
0251-- F ---16
0252-- DP---25
0253-- YE---24
0254--IND---31
0255-- X ---36
0256-- a ---13
0257--XFR---67
0258-- 1 ---01
0259-- 9 ---11
0260-- UP---27
0261-- a ---13
0262--X=Y---50
0263--RUP---22
0264--GTO---44
0265--LBL---51
0266-- G ---15
0267--RUP---22
0268--GTO---44
0269--LBL---51
0270-- H ---74
0271--LBL---51
0272-- G ---15
0273--XFR---67
0274--DIV---35
0275-- 1 ---01
0276-- 8 ---10
0277--LBL---51
0278-- H ---74
0279-- UP---27
0280-- 7 ---07
0281-- 5 ---05
0282--XFR---67
0283-- + ---33
0284-- a ---13
0285--XTO---23
0286-- b ---14
0287--YTO---40
0288--IND---31
0289-- b ---14
0290--YTO---40
0291-- + ---33
0292-- 7 ---07
0293-- 5 ---05
0294--LBL---51
0295-- I ---65
0296-- 1 ---01
0297-- E ---60
0298--GTO---44
0299--LBL---51
0300-- D ---63
```

Table 38 Extra Digital Device Interference Test Program (HP 9810A)(cont)

```
0301--LBL---51
0302-- J ---75
0303-- 1 ---01
0304-- 7 ---07
0305--XFR---67
0306-- + ---33
0307-- 2 ---02
0308-- 0 ---00
0309--XEY---30
0310-- α ---13
0311--X>Y---53
0312--GTO---44
0313--LBL---51
0314-- K ---55
0315--CNT---47
0316--PSE---57
0317--PSE---57
0318-- 7 ---07
0319-- 5 ---05
0320--XEY---30
0321-- α ---13
0322-- + ---33
0323--YTO---40
0324-- b ---14
0325-- DN---25
0326--YTO---40
0327--IND---31
0328-- b ---14
0329--GTO---44
0330--LBL---51
0331-- I ---65
0332--LBL---51
0333-- K ---55
0334--FMT---42
0335-- 4 ---04
0336-- 1 ---01
0337--FMT---42
0338--SFL---54
0339--FMT---42
0340-- 9 ---11
0341-- 3 ---03
0342--XTO---23
0343-- α ---13
0344--LBL---51
0345-- L ---72
0346--XFR---67
0347--IND---31
0348-- α ---13
0349-- UP---27
0350-- 1 ---01
0351-- E ---60
0352--YTF---67
0353--IND---31
0354-- α ---13
0355--CNT---47
0356-- - ---34
0357-- 1 ---01
0358-- 0 ---00
0359-- X ---36
0360--YTO---40
0361--IND---31
0362-- α ---13
0363-- 1 ---01
0364-- E ---60
0365-- 1 ---01
0366-- 0 ---00
0367-- 5 ---05
0368-- UP---27
0369-- α ---13
0370--X<Y---52
0371--GTO---44
0372--LBL---51
0373-- L ---72
0374--CNT---47
0375--CNT---47
0376--XFR---67
0377--IND---31
0378-- α ---13
0379-- UP---27
0380-- 1 ---01
0381-- E ---60
0382--XFR---67
0383--IND---31
0384-- α ---13
0385--CNT---47
0386-- - ---34
0387--EEX---26
0388-- 3 ---03
0389-- X ---36
0390--YTO---40
0391--IND---31
0392-- α ---13
0393-- 1 ---01
0394-- E ---60
0395-- YE---24
0396--IND---31
0397-- α ---13
0398--EEX---26
0399-- 3 ---03
0400-- X ---36
0401-- [illegible]---40
0402--IND---31
0403-- α ---13
0404--XFR---67
0405-- 7 ---07
0406-- 5 ---05
0407--CHS---32
0408-- UP---27
0409--XFR---67
0410-- 9 ---11
0411-- 2 ---02
0412-- + ---33
0413--YTO---40
0414-- 7 ---07
0415-- 4 ---04
0416--XEY---30
0417--DIV---35
0418--FMT---42
0419--FMT---42
0420-- π ---56
0421--CLX---37
0422--INT---64
0423--FMT---42
0424--PNT---45
0425-- DN---25
0426-- K ---55
0427-- 4 ---04
0428-- UP---27
0429-- 1 ---01
0430-- 0 ---00
0431-- X ---36
0432--YTO---40
0433-- 7 ---07
0434-- 5 ---05
0435--XFR---67
0436-- 9 ---11
0437-- 3 ---03
0438--PNT---45
0439--XFR---67
0440-- 1 ---01
0441-- 0 ---00
0442-- 6 ---06
0443-- UP---27
0444--FMT---42
0445-- 5 ---05
0446--EEX---26
0447--FMT---42
0448--FMT---42
0449-- α ---13
0450-- E ---60
```

Table 38 Extra Digital Device Interference Test Program (HP 9810A) (cont)

```
0451--  C  ---61
0452--  0  ---71
0453--  o  ---13
0454--  D  ---63
0455--CNT---47
0456--FMT---42
0457--STP---41
0458--  3  ---03
0459--  6  ---06
0460--  UP---27
0461--  7  ---07
0462--  3  ---03
0463--FMT---42
0464--  5  ---05
0465--XTO---23
0466--  1  ---01
0467--XTO---23
0468--  +  ---33
0469--  0  ---00
0470--XFR---67
0471--  0  ---00
0472--  UP---27
0473--  5  ---05
0474--X>Y---53
0475--GTO---44
0476--LBL---51
0477--  B  ---66
0478--CNT---47
0479--GTO---44
0480--LBL---51
0481--  A  ---62
0482--STP---41
0483--END---46
```

Table 39 Extra Digital Device Data Reduction and Print

```
10 DIM A[4,36],C[36]
20 DISP "FILE #";
30 INPUT M
40 FOR K=0 TO 3
50 LOAD  DATA M+K,C
60 FOR J=1 TO 36
70 IF K#0 THEN 90
80 C[3]=0
90 A[K+1,J]=C[J]
100 NEXT J
110 NEXT K
120 FOR J=1 TO 12
130 PRINT
140 NEXT J
150 FORMAT 4F13.4,F1.1
160 FORMAT 6X,"PARAMETER   0 RF LEVEL   1 RF LEVEL   2 RF LEVEL   3 RF LEVEL"
170 WRITE (15,160)
180 PRINT
190 WRITE (15,150)"       S.N.   ",A[1,1],A[2,1],A[3,1],A[4,1]
200 WRITE (15,150)"       P DIS. ",A[1,2],A[2,2],A[3,2],A[4,2]
210 WRITE (15,150)"       C.F.   ",A[1,3],A[2,3],A[3,3],A[4,3]
220 PRINT
230 FOR K=1 TO 16
240 FORMAT F5.0,1X,4F13.4,F1.1
250 WRITE (15,240)"       P",K,A[1,K+3],A[2,K+3],A[3,K+3],A[4,K+3]
260 NEXT K
270 WRITE (15,150)"       P INC. ",A[1,20],A[2,20],A[3,20],A[4,20]
280 PRINT
290 WRITE (15,150)"       V OUT 1",A[1,21],A[2,21],A[3,21],A[4,21]
300 WRITE (15,150)"       I OUT 1",A[1,22],A[2,22],A[3,22],A[4,22]
310 WRITE (15,150)"       V OUT 2",A[1,23],A[2,23],A[3,23],A[4,23]
320 WRITE (15,150)"       I OUT 2",A[1,24],A[2,24],A[3,24],A[4,24]
330 WRITE (15,150)"       V IN 1 ",A[1,25],A[2,25],A[3,25],A[4,25]
```

Table 39 Extra Digital Device Data Reduction and Print (cont)

```
340 WRITE (15,150)"      I IN 1 ",A[1,26],A[2,26],A[3,26],A[4,26]
350 WRITE (15,150)"      V IN 2 ",A[1,27],A[2,27],A[3,27],A[4,27]
360 WRITE (15,150)"      I IN 2 ",A[1,28],A[2,28],A[3,28],A[4,28]
370 WRITE (15,150)"      V IN 3 ",A[1,29],A[2,29],A[3,29],A[4,29]
380 WRITE (15,150)"      I IN 3 ",A[1,30],A[2,30],A[3,30],A[4,30]
390 WRITE (15,150)"      V IN 4 ",A[1,31],A[2,31],A[3,31],A[4,31]
400 WRITE (15,150)"      I IN 4 ",A[1,32],A[2,32],A[3,32],A[4,32]
410 WRITE (15,150)"      V CC   ",A[1,33],A[2,33],A[3,33],A[4,33]
420 WRITE (15,150)"      I CC   ",A[1,34],A[2,34],A[3,34],A[4,34]
430 WRITE (15,150)"      I GND  ",A[1,35],A[2,35],A[3,35],A[4,35]
440 FOR K=1 TO 17
450 PRINT
460 NEXT K
470 M=M+4
480 GOTO 40
490 END
```

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